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ABSTRACT

The final report and a general summary of a research project that assessed the developmental differences in children's use of constructive reading strategies are presented in this paper. The five chapters of the final report offer descriptions of separate studies conducted in the following areas: children's metacognitive knowledge about reading; the ability of children to monitor, organize, and recall stories; comprehension monitoring in good and poor readers; inferential distance and children's memory for pictorial sequences, and comprehension strategies and repeated recall with good and poor readers. A statement of the major conclusions of the project is included. The general summary contains brief descriptions of the various studies. (FL)

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FINAL REPORT

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The Development of Constructive Comprehension Skills

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ABSTRACT

The purpose of this research has been to describe the different comprehension skills available to beginning and accomplished readers. Data derived from interveiws with 8 and 12 year olds indicated that young children were aware of the influence of some reading dimensions, such as interest, familiarity, and length, but were less sensitive to the semantic structure of paragraphs, goals of reading, and strategies for resolving comprehension failures. In several studies, it was found that young and poor readers could not monitor the meaning of stories while they read as shown by their lower rates of spontaneous oral corrections and directed underlining of anomalous information. Poor readers' lack of metacognitive aspects of reading, ineffective monitoring strategies, poor comprehension, and inability to organize and maintain story units in memory were highly correlated within and between subjects in several studies. A clear implication of this research is that instruction to beginning readers should include information regarding the goals of reading, the structure of written material, and strategies for checking and integrating the meaning in order to resolve comprehension failures.

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Introduction

Despite the persistent historical emphasis on reflective, constructive, and strategic aspects of reading (e.g., Brown, 1978; Dewey, 1910; Solomon & Postman, 1952; Stauffer, 1969; Thorndike, 1917), there is surprisingly little data on reading comprehension skills compared to data on perceptual analyses and orthographic - phonetic translation of beginning readers. Comprehension can be analyzed in many ways; according to the level of meaning apprehended by the reader such as literal, inferential, and evaluative or according to the strategies used by the reader. This proposal is a process approach to comprehension that emanates from my work on constructive aspects of memory development and seeks to determine how children understand and use strategies such as inferential elaboration and comprehension monitoring during reading.

Two consistent findings emerge from current research on cognitive development, specifically memory investigations. First, young children fail to produce task relevant strategies to organize, transform, and rehearse information. Second, young children seem unaware of many task and strategy variables that affect performance. These deficits in strategy production/utilization and metacognitive knowledge are highly correlated with poor performance on memory and problem-solving tasks (Brown, 1978; Brown & De Loache, 1978; Flavell, 1978).

These same deficits have been identified in learning disabled children (Torgesen, 1975) and poor readers (Singer & Ruddell, 1976). In an excellent review, Golinkoff (1976) concluded that poor readers impose little organization on texts, read in a word-by-word fashion, invoke few flexible strategies, and seem unaware of what good comprehension entails. Smith (1975) suggested that poor readers do not seem to expect or care if the material makes sense but read in order to pronounce all the words correctly. Poor readers do not utilize syntactic cues (Guthrie & Tyler, 1976; Vogel, 1976), do not process words in text at an intersentence level (Clay & Imlach, 1971), and do not use contextual information to infer proper responses on a cloze task (Neville & Pugh, 1976). Clearly, poor readers do not take advantage of textual clues or special strategies to aid comprehension.

Our studies during the past several years have examined these limitations of young and poor readers in an attempt to provide a detailed description of reading development and the related cognitive skills. Each study is presented as a separate chapter in this report to facilitate the presentation of data. Rationales, introductions, and discussions are also provided for each project separately.

Chapter 1

Children's Metacognitive Knowledge About Reading

Solving problems, remembering a series of words or pictures, and comprehending prose are often deliberate actions that require self-invoked plans and cognitive skills. In order to accomplish these goals, a learner must coordinate a variety of information regarding the task and his available strategies and apply it appropriately to the problem at hand. The general knowledge that guides effective selection and implementation of task relevant skills has been referred to as metacognition (Brown, in press; Flavell, 1977). It is regarded as a "higher" level of thinking than task-specific strategies because metacognitive knowledge constitutes transituational information about the parameters of learning performance. Metacognitive knowledge serves an executive function of coordinating and directing the learner's thinking and behavior.

Flavell and Wellman (1977) identified person, task, and strategy variables as three important categories of metacognitive knowledge that might help children to remember effectively. First, children need to know about their own enduring characteristics and transient conditions that influence performance. Learners or memorizers need to appraise realistically their potential in order to engage in skills commensurate with their ability. Second, children need to know about the purposes, scope, and requirements of the task before the problem can be efficiently attacked. Third, one needs to be aware of the existence of relevant strategies and to recognize the need to apply them. Further, one must form plans, generate hypotheses, check one's progress, evaluate results, and generalize behavior. In some senses these are ideal characterizations of the knowledge required to solve problems or remember. Yet an extensive literature, particularly on memory development, has shown that while adults and older children are often sensitive to metacognitive variables, children younger than eight years of age are less sensitive (Brown, in press; Flavell, 1977). Since the development of children's metacognitive knowledge is associated with efficient learning, remembering, and communicating, it may provide a critical link in explaining the transition from a novice to a sophisticated problem-solver.

Reading is a complex behavior that involves interactions among perceptual processes, cognitive skills, and metacognitive knowledge. For example, Stauffer (1969) cited a 1936 definition by Gray that noted that effective reading "assumes that the reader not only recognizes the essential facts or ideas presented, but also reflects on their significance, evaluates them critically, discovers relationships between them, and clarifies his understanding of the ideas apprehended (emphasis added, pp. 8-9)." Awareness and deliberate use of such comprehension monitoring strategies is critical for proficient reading. The value of thinking about one's thinking, or awareness of metacognitive knowledge, and its relationship to good reading skills has been stressed repeatedly since Dewey's (1910) emphasis on reflective thinking. A recent quotation from Eleanor Gibson is particularly illuminating with respect to the role of metacognition in reading.

"One (trend in cognitive development) that seems to me especially important is the increasing ability to be aware of one's own cognitive processes, from the segmentation of the phonetic stream all the way up to the understanding of the strategies of learning and problem-solving. There seems to be a

consciousness-raising that goes along with many aspects of cognitive development, and it turns out, I think, to be associated with attaining mature reading skills" (Gibson, 1974, p. 25).

Despite the importance attributed to reflective thinking and the role of metacognitive knowledge, little research has been conducted to assess children's knowledge about the parameters of reading. If the foregoing claims about the importance of metacognition are true, then children's understanding of skills, purposes, and dimensions of reading should influence how they learn to read. What kinds of metacognitive understanding do young children have about reading? Unfortunately, the answer, much like the data on metamemory (see Flavell and Wellman, 1977), seems to be "not much." Reid (1966) conducted a series of interviews with five-year-old beginning readers to find out what concepts they had about the activity of reading. She observed that children approached reading as "a mysterious activity, to which they come with only the vaguest expectancies," and "were not even clear whether one read the pictures or the other marks on the paper (pp. 60-61)." Although most four and five year olds can differentiate writing from other characters and drawings (Lavine, 1977), beginning readers do not seem to understand the goals or meaning of reading. Clay (1973) found that 66% of five-year-old school entrants in New Zealand did not know that print rather than pictures told the story. After six months of school nearly 90% of the children knew this metacognitive information about the task. Yet some children still confused the purposes and nature of reading after a year of schooling.

In addition to conceptualizing the purposes and scope of reading tasks, children must learn to employ strategies such as predicting, planning, checking, and generalizing. The propensity to engage in or understand the need for comprehension monitoring increases with age. Self-correction rate in oral reading, for example, is a spontaneous and overt form of monitoring one's reading. In Clay's (1973) research, the top 50% of young readers corrected spontaneously one of three errors while poor readers only corrected one of 20 errors. In fact, the rate of self-correction was more closely related to progress in the first three years of instruction, when the emphasis is on oral reading, than either intelligence or reading readiness scores (Clay, 1973). Clay's results indicated that comprehension checking is a useful strategy and develops with skill efficiency in reading. Beginning readers and poor readers are less likely or less able to monitor their own understanding. For example, when Clay (1973) asked large groups of seven and eight year olds, "What do you do when you come to a word you don't know" nearly 50% of the seven year olds responded "Don't know," "I'd skip it," or reported other kinds of defaults. Only 4% of the eight year olds responded with these kinds of shrug-the-shoulders answers. Usually they answered that they would analyze the word parts, use the sentence context, or solicit help.

In general, beginning readers, like young children in other cognitive tasks, have an extremely limited understanding of the task dimensions and the need to apply strategies for reading. The purpose of the present investigation was to extend the analysis of children's metacognitive knowledge about reading in order to provide a broader description of their conceptualizations. Standardized questions were given to children in order to assess their understanding of person, task, and strategy variables involved in reading

This was a preliminary study modelled after Kreutzer, Leonard, and Flavell's (1975) investigation of children's metamemorial knowledge. Our procedures and questions were guided by their work and our own intuitions about important parameters of reading. In order to extend the research on beginning readers (Clay, 1973; Reid, 1966) and to coincide with the age ranges usually studied in metamemory tasks, two groups of children who could already read, but who were of widely different ages and abilities, were tested.

Method

Subjects

The subjects were 20 second graders (mean age = 7-9, range = 7-2 to 8-9) and 20 sixth graders (mean age = 11-9, range = 11-2 to 12-2) balanced for sex and selected without regard for reading ability.

Materials

Eighteen interview items, each consisting of varying numbers of questions were organized in a script format. The items were designed to assess children's knowledge in three general categories. In the category of person variables, knowledge that subjects had about individual reading abilities was assessed. Questions about the effects of age, motivation, sex, specialized skills, and environmental limitations on reading abilities were included. Task variable questions were designed to measure children's knowledge about the effects of test mode, length of story, speed, preference, goals, structure of paragraphs, and familiarity. Questions regarding strategy variables measured children's awareness of rereading, inference, imagery, and comprehension monitoring as reading skills. Due to the exploratory nature of the study, several unproductive items were included on the interview script. Some were purposefully incorporated in order to maintain children's interest and to preserve the flowing, conversational nature of the interview. Other items were ambiguous or resulted in uninterpretable response patterns. Responses to these questions are not reported and this paper is a selective report of consistent data that bear on developmental aspects of reading.

Procedure

Subjects were interviewed individually in a quiet room at school. The child and the experimenter were seated side by side at a table with a microphone and tape recorder in front of them. The children were informed of the nature of the interview and given an opportunity to listen to their own voices on the tape recorder. It was emphasized that there were no "right" or "wrong" answers to the questions and that we "just want to know what you think." The questions were read from the script in a conversational manner in the same order for all children. If a subject was unable to answer or clearly misunderstood the question, it was repeated. If the repetition failed to elicit a response, the question was rephrased until an answer was produced. The entire session was tape recorded. In general the sessions were relaxed and informal and lasted about 25 minutes.

Scoring

Each child's responses were transcribed into a written account from the tape recorded interview. Two judges checked the transcriptions and recoded lengthy responses into one or two word summaries that were semantically equivalent to the original reports. There were fewer than 2% disagreements between judges in this phase of data reduction, and they were resolved through mutual agreement. After preliminary examination of the data, several categories of responses were established for each interview item. Only the first responses given by each child were analyzed in order to control for differences in verbalization among children (except in those cases where the child obviously misunderstood the question). As a result of experimenter oversight, some subjects were not administered all of the interview items. Omissions were few and considered to be random; consequently, sample size varied slightly for different questions.

Results and Discussion

In order to facilitate presentation of the data, each of the 18 interview questions is given verbatim and grouped according to person, task, and strategy categories. The intended focus of the question and the description of children's responses are provided for each numbered interview item. Differences between young and old children's understanding of the goals, skills, and dimensions involved in reading are shown in separate tables and were tested statistically for each item.

Person Variables

Specialized Skill. One relevant aspect of reading is an individual's perception of the characteristics of an accomplished reader. Knowing the abilities of a competent reader could serve as a guiding concept to children about their personal limitations and goals in reading. Two questions revealed children's knowledge about individual abilities. Children were asked:

1. "What makes someone a really good reader?" Although responses were varied, they were classified into the four categories shown in Table 1, general knoweldge, special skill, motivation, and don't know. Seventy percent of the sixth graders but only 40% of the second graders reported that practice and special skills were necessary components of good reading. On the other hand, 25% of the younger children were unable to report any qualifications of good readers, while none of the older children were unable to speculate about the characteristics of good readers. When knowledge of special skills was compared to the less sophisticated responses of the combined categories of general knowledge, motivation, and don't know, the grades differed significantly, χ^2 (1) = 4.94, $p<.05$.

A second question provided additional information about the specific skills possessed by good readers and was designed to determine whether children perceive reading ability as a general manifestation of school achievement or as a specialized skill. Children were presented with the following situation:

2. "The other day I talked to a boy/girl who was really good at arithmetic. Then I asked him/her if he/she was a good reader. What do you think he/she said?" (Questions were phrases in terms of the same sex of subjects.) Twelve of twenty second graders reported that good mathematics skills are

Table 1

Frequency of Subjects Reporting Various Characteristics of Good Readers

	Special Skills			General Skills		Motivation		Don't Know
Grade	Practice	Vocabulary	Pronunciation Skills	General Knowledge[a]	Schooling and Age	Likes Reading	Tries Harder	Don't Know
Second	6	1	0	5	2	0	1	5
Sixth	14	0	1	1	0	2	2	0

[a]Responses included "knows more," "better learner," and "more experience."

associated with good reading skills, while fourteen of twenty sixth graders realized that the two skills were not necessarily dependent. One child in each grade responded that reading depends on the individual child. The age difference was significant, χ^2 (1) = 3.83, p .05. Responses to questions 1 and 2 indicated that older children reported that proficient reading involves specialized skills while younger children did not.

Motivation and Limitations. Another metacognitive bit of information relevant to a person's concept of his abilities is the awareness of limiting conditions and how one might overcome them. We were curious to see if children are sensitive to reading development as a function of opportunity and motivation and gave them the following hypothetical situation:

3. "Suppose there were two boys named John and Alan who came from different homes. John's parents were wealthy and John had lots of toys and books. Alan's parents, though, were poor and didn't have many books at home. Do you think one of these boys was a better reader at school? Which one? Why?" Nearly all of the younger children (90%) reported that the rich boy with more environmental opportunities could read better. On the other hand, 65% of the sixth graders reported that the poor boy would read as well, if not better than the rich boy (35% reported that the poor boy would be better). They explained that the poor boy's limitations might be qualified by motivation and other factos. A typical justification reported by sixth graders was: "He (the poor boy) would spend more time reading and the rich boy would play around." Significantly more sixth graders than second graders reported that the poor boy would be equal to or a better reader than the rich boy, χ^2 (1) = 8.?, p .005.

Task Variables

Materials. Three examples of task variables that can influence reading are the length of the passage, the familiarity of the story content, and the reader's interest in the story. The following questions were presented to children to assess their awareness of these parameters:

4. "One day I asked Jim to read a story that was five pages long while Tom read a story that was two pages long. Which boy took the longest to read the story? Who do you think remembered the most?"

5. "The whole class was going to read a story about New York City. Ann was in New York last summer for her vacation. Do you think that the story might be easier or harder for Ann to understand than Jane who had never been to New York?"

6. "What's your favorite kind of story? (Child's response X). Say your teacher wanted you to read something, something you really didn't like as much as X. Which do you think you would read faster, X or the teacher's story? Which one would be easier to remember?"

The majority of children from both age groups reported that these variables affect reading. All sixth graders and all second graders reported that long passages require more reading time than short passages and all sixth graders and 75% of the second graders reported that familiarity with the story content facilitates story comprehension. Additionallly, 65% of the sixth graders and 75% of the second graders reported that preferred stories can be read faster than stories that are dislike, and 90% of the sixth graders and 85% of the

second graders reported that preferred stories would be easier to remember. Thus, no significant age differences were found for the length, familiarity, and interest variables.

Reading Mode. A task parameter relevant to reading is the mode in which material is read. To assess this variable, children were asked:

7. "Which is quicker, reading out loud or reading to yourself?" Eighty-nine percent of the sixth graders and only 50% of the second graders indicated that reading silently is faster than reading aloud, while 45% of the second graders and only 11% of the sixth graders replied that reading aloud and silently resulted in the same reading speed. A comparison of "aloud" and "silent" re-responses across grades yielded significant grade differences, χ^2 (1) = 4.60, $p < .05$.

Structural Cues. The reader's knowledge of structural features of prose might serve as a guide to comprehension. Several questions were constructed in order to investigate children's awareness of paragraph structure. Children were asked,

8. "Is there anything special about the way sentences go into a paragraph or story?"
Seventy percent of the sixth graders and 47% of the second graders indicated that they were aware that sentences are organized within a paragraph, but this age difference was not significant. However, only two of the nine second graders who reported awareness of structural features of paragraphs gave justifications that specified the sequential nature or common topics of sentences in paragraphs while nine of 14 sixth graders justified their answers in these terms. Significantly more sixth graders were aware of the special organization of sentences within paragraphs than second graders, χ^2 (1) = 5.00, $p < .05$.

In order to investigate children's awareness of specific paragraph parameters, subjects were asked,

9. "What does the first sentence usually do for a paragraph or story?"

10. "What does the last sentence do?"
As shown in Table 2, 80% of the sixth graders reported that the leading sentence is a semantic introduction to the paragraph, while only 20% of the second graders reported that sentence attribute. The majority of the second graders did not know the function of the first sentence or reported that it began the paragraph or started with a capital letter. Young children were less aware of the semantic characteristics of the first sentence, χ^2 (1) = 9.24, $p < .005$.

In response to question 10, 50% of the sixth graders and only one second grader reported semantic summary properties for the last sentence of a paragraph. The remaining subjects either reported temporal or punctuation properties of the sentence or said, "I don't know." Comparing "summary" responses with all other responses yielded a significant age difference, χ^2 (1) = 7.07, $p < .01$. While many children from both grade levels reported that sentences are organized to form paragraphs, significantly more sixth graders were aware of the semantic

Table 2

Characteristics of First and Last Sentences in Paragraphs

Grade	Semantic Characteristics		Nonsemantic Characteristics	
	Introduce or Summarize Topic	Temporally Begin or End	Orthographic[a]	Don't Know And Irrelevant
		First Sentence		
Second	6	2	3	8
Sixth	17	2	0	1
		Last Sentence		
Second	1	5	3	9
Sixth	10	5	1	4

[a]Includes responses such as "starts with a capital letter" or "ends with a period."

properties of the first and last sentences of a paragraph.

Goals

In order to solve problems, one must understand the task, form a conception of the goal, and select and implement appropriate means to attain that goal. The way in which young children perceive the goal of a given task may differ from older children. To test this possibility for reading, children were asked,

11. "Do you ever tell the story that you read to someone else? What do you try to tell them, all the words or just the ending or what?"

Ninety-five percent of the sixth graders indicated that they would attempt to reproduce the story meaning during recall while 45% of the second graders responded that they would attempt to reproduce the story verbatim. Comparing "verbatim" and "meaning" responses across grades yeilded a significant grade difference, χ^2 (1) = 7.68, $p < .01$. Almost all the sixth graders perceived the goal of a story recall task as meaning construction, but the goal for nearly half of the second graders was exact reproduction.

If young and old children perceive task goals differently, it might be expected that they also differ in their awareness of the appropriate selection of a means to attain their selected goal. The following question was asked to reveal information relevant to this hypothesis:

12. "The other day I asked Bill to read a story and then to tell me what he read. Before he started reading, though, he asked me if I wanted him to remember the story word for word or for the general meaning. Why do you think he asked me that?"

The wide variety of responses to this question were grouped into the following three conceptual categories: specific strategy, general aid, and other responses. Children's responses were included in the first category if they indicated that knowledge of task goals could elicit specific study strategies. As an example, one sixth grader reported that "If you wanted him to remember words, he would take a lot longer 'cause he would memorize, if meaning--(he would) read the parts of the paragraph with important facts." If children reported that knowing the goal of the task would help them respond correctly but did not specify how it would help, their response was scored as "general aid." This category included responses indicating that knowing the goal would help them remember and that they would know what information was required for recall. The "other response" category included bizarre justifications and "I don't know responses." As shown in Table 3 60% of the sixth graders realized that knowing the goal of a reading task can lead to the employment of different strategies while only one second grader indicated any awareness of differential strategy use applied to the presented situation. Fifty percent of the second graders had no idea why someone would want to know the goal of the reading task. The trend for more sixth graders to indicate specific strategies and for more second graders to indicate "other responses" was significant, χ^2 (1) = 12.96, $p < .001$.

A potential reason that second graders do not differentiate exact reproduction from meaning reconstruction is that they perceive exact word recall as equivalent to, or at least as easy as, recall of the story meaning. To investigate

Table 3

Frequency of Subjects Reporting Why Someone Would Want To Know the Goal of a Reading Task

Grade	Specific Strategy	General Aid		Other		
	Study Differently	Help Remember	Know Required Answer	Just to Know	Irrelevant	Don't Know
Second	1	2	2	3	2	10
Sixth	12	1	3	0	2	2

that possibility, children were asked,

13. "Which would be easier to do, read word for word or for the general meaning?"
Sixty-five percent of the second graders and 90% of the sixth graders reported that meaning recall is easier than exact reproduction. The grade differences were not significant indicating that most of the second graders realized that meaning recall was easier than exact reproduction.

Another reason for differential strategy use by grades may be that second graders are not aware of the importance of selecting specific strategies for particular goals. We aksed,

14. "Would you do anything differently if you had to remember all the words?"
Only 33% of the second graders, as opposed to 80% of the sixth graders, said they would or might execute an exact reproduction task differently than a meaning recall task. Significantly more sixth graders than second graders indicated that they would employ different strategies for the different tasks, χ^2 (1) = 6.46, $p < .025$.

In general, second graders reported that exact recall is more difficult than meaning recall but were not able to report different strategies, indicating an awareness of differential task difficulty, but illuminating their obliviousness of matching means to goals. Older children seemed to be more aware of subordinating appropriate means to specific goals and better able to discriminate the varying difficulty of tasks than younger children.

Strategy Variables

Skimming. The previously discussed goal differences of second graders reiterating words and sixth graders reconstructing meaning may indicate that younger children perceive the purpose of reading as decoding while older children perceive a goal of meaning extraction or construction. This difference should be reflected in perceived strategies for skimming. If the reader's goal is to decode written material then he/she may be expected to attend to easily pronounced and familiar words while skimming. Readers concerned with meaning extraction would attend to those words and phrases which convey the most information. To examine this hypothesis, children were asked,

15. "If you had to read a story very quickly and could only read some of the words, which ones would you try to read?"
As indicated in Table 4, 70% of the second graders and only 30% of the sixth graders reported that while skimming they would attend to words that would be easy for them to read. Sixty percent of the sixth graders and none of the second graders indicated that they would skim for words that yielded the most information. The other 10% of the sixth graders indicated a skimming strategy of reading only the first portion of each paragraph. An analysis of the categories Easy words versus Information yielded a significant difference between grades, χ^2 (1) = 16.08, $p < .001$.

Table 4

Frequency of Subjects Attending to Different Aspects of a Paragraph While Skimming

	Easy		Informative		Other		
Grade	Familiar Words	Easy Words	Informative Words	Difficult Words	First Sentence	Any Half	Don't Know
Second	5	10	0	0	0	3	2
Sixth	1	5	6	6	2	0	0

Resolving Comprehension Failures. Determining the meaning of unknown words and sentences is a crucial aspect of reading. Even sophisticated readers encounter incomprehensible material and need to draw upon strategies to resolve those comprehension failures. Several questions were constructed to investigate children's awareness of their own methods for determining unknown information. We asked,

16. "What do you do if you don't understand a word that you read?"
As illustrated in Table 5, all children indicated a strategy for determining an unknown word. Both groups said they would ask other people for help in learning new words (40% of the second graders and 35% of the sixth graders). Thirty-five percent of the sixth graders reported that they would seek help from a dictionary and 40% of the second graders would try to sound out the words. The trend for second graders to respond "sound-out" and sixth graders to respond "dictionary" was significant (Fisher's exact $p < .005$) and offers further support for the hypothesized decoding goal of young children.

In order to investigate children's awareness of strategies to resolve sentence comprehension failures, they were asked,

17. "What do you do if you don't understand a whole sentence?"
Examination of Table 5 indicates that the most frequent answer was again to seek help from other people (40% of the second graders and 55% of the sixth graders), but unlike responses for determining words, 30% of the second graders could not report how they would resolve this comprehension failure. Comparing "don't know" responses with "ask another person" responses yielded a significant grade difference (Fisher's exact $p < .005$).

In order to determine if children would reread a passage to comprehend a sentence, the children were asked,

18. "Do you ever have to go back to the beginning of a paragraph or story to figure out what a sentence means? What?"
Fifty-five percent of the second graders and 80% of the sixth graders reported that they would reread the paragraph. The difference between grades was not significant. However, 75% of the sixth graders who responded that they would reread reported the justification that rereading the paragraph would provide information and contextual cues useful for determining the sentence meaning. Eighty-eight percent of the second graders who responded reread reported non-strategic justifications or could not justify their response. Significantly more sixth graders reported that they would reread in order to utilize contextual cues to resolve sentence comprehension failures, χ^2 (1) = 6.31, $p < .025$. In general, young children had few resources available for deciphering the meaning of unknown words or sentences and seemed insensitive to the need for resolving comprehension failures.

General Discussion

Young children in this study were unaware of many important parameters of reading. They were not sensitive to task dimensions or the need to invoke

Table 5

Frequency of Subjects Reporting Strategies for Resolving Comprehension Failures

Grade	Strategic Resolution					Nonstrategic Effort or Default			
	Ask Someone	Dictionary	Soundout	Context	Reread	Think	Try	Skip	Don't Know
				Unknown Word					
Second	8	0	8	0	0	1	1	2	0
Sixth	7	7	2	1	1	0	0	2	0
				Unknown Sentence					
Second	8	0	0	1	1	1	1	2	6
Sixth	11	0	0	2	3	0	0	4	0

special strategies for different materials and goals. They reported few strategies or reasons for checking their own understanding or progress and were not aware of specific characteristics of proficient readers. Although young children were aware of limitations such as opportunity to read, they did not report neutralizing factors such as motivation for overcoming those obstacles. While young children were aware of some task variables (e.g., interest, familiarity, and story length) and indicated that sentences are organized within paragraphs, they were insensitive to specific semantic features such as sequencing or common topics. Also, they were unaware of the introductory and summary qualities of first and last sentences in paragraphs. Second graders were less sensitive to the strategies required by different reading and memory goals. They reported fewer strategies than older children and were not as accurate in coordinating particular strategies with specific task goals. On the other hand, older children were aware of the existence of various reading strategies and were sensitive to when and how to use them.

Children's reported awareness of metacognitive knowledge about reading is consistent with data on children's reports about metamemory (Kreutzer, Leonard and Flavell, 1975). Young children from both studies were aware of the facilitative effects of familiarity with task materials, recursive operations (rereading and more study time), and paraphrasing. Consistent age differences were also found. Young children tend to refer to external sources such as other people to resolve unknown information, while older children generate more internally oriented strategies. Older children in both studies distinguished between tasks where the perceived level of task difficulty has implications for amount and kind of preparatory action and were generally more sensitive to subordinating the appropriate means to the service of remembering or reading.

A general implication of children's responses in the present study is that second graders perceive reading as an orthographic-verbal translation problem rather than as a meaning construction and comprehension task. Young children were relatively insensitive to semantic dimensions of paragraphs or to goals and methods of meaning apprehension. They focused on exact story reproduction rather than recall of a story's general meaning and thought reading aloud was quicker than silent reading. Also, they seemed to be unaware of the special characteristics of good readers and the special strategies required for monitoring understanding. In general second graders focused on decoding goals rather than semantically related goals for reading and indicated few strategies appropriate for information extraction or construction. Sixth graders were more aware of meaning dimensions of paragraphs and of the skills required to achieve understanding.

The present data is restricted to descriptions of age-related changes in children's reports, but there are several speculations that could be offered to explain the development of metacognitive knowledge about reading. A likely explanation is that educational materials and teachers' strategies are oriented towards decoding goals and translation skills in beginning readers. Young children's metacognitive knowledge would be entirely consistent with explicit information provided by teachers if this is true. An alternative speculation is that children induce and abstract metacognitive knowledge from many settings and problem-solving situations and that greater awareness of means, goals, and task parameters about reading reflects a general developmental accomplishment (Paris, 1978). In support of this view, children seem to acquire an explicit

awareness of mnemonic skills and goals between the ages of six and twelve (Flavell & Wellman, 1977). Indeed, young children's difficulties with deliberate problem-solving situations such as memory, reading, and referential communication may be a manifestation of their incomplete metacognitive awareness of person, task, and strategy variables that influence performance.

Research on the relationships between teachers' behavior and students' metacognitive knowledge, reading knowledge and actual reading performance, and understanding of reading vis a vis other cognitive tasks is needed to elucidate the origins of children's metacognitions. Combining behavioral research with interview studies such as the present investigation would help to disentangle the confounds between children's verbal skills and reported knowledge and help to isolate the functional aspects of metacognitive knowledge that guide children's performance. Investigations that employ such converging operations may yield information regarding the cognitive processes and knowledge that underlie efficient reading.

Although the pragmatic implications are numerous, we think the present research suggests several fundamental relations among instruction, metacognitive development, and reading proficiency. First, instructional activities may influence readers' planfulness and facilitate self-guided behavior. A proficient reader has learned to define a purpose to a particular task and is flexible so that different goals can be set under different conditions. For example, teachers may provide instruction to readers for regulating behavior according to passage difficulty, story length, amount of memory demands, and various amounts of study opportunities in order to maximize comprehension and memory. If one is aware of explicit task goals and aware of how different task parameters affect those goals, one can more easily select strategies and execute processes to meet those goals. Deliberate and efficient goal setting may be sensitive to direct instruction and is one important relationship between metacognition and reading (Stauffer, 1969).

A second potential advantage of explicit awareness of reading variables is that it permits one to deliberately ignore irrelevant information and attend to meaningful aspects of the task. For example, proficient readers may learn to ignore pictures, type setting, and background features of the message when they are tangential to the goal of meaning extraction. Deliberate attention involves perceptual processes but also could involve the recruitment of special strategies for understanding. A proficient reader may utilize such strategies as underlining, notetaking, or selective rereading. Incorporation of such skills into the readers' knowledge base and awareness of the value of those skills must precede their deliberate employment. Awareness of one's potential abilities and the development of a repertoire of task relevant information may be acquired through a combination of instruction and induction. The development of the reader's repertoire of knowledge, that will be necessary for deliberate and subsequently automatic skills of decoding and comprehending, may be facilitated by explicit instructions and ample reading experience. These aspects of reading, planful goal setting, selective attention, strategy recruitment, and a repertoire of information interact continuously during competent reading and may be amenable to training and remediation.

One purpose of this study has been to illustrate how reading skills can be embedded in a cognitive framework and related to children's developing appreciation of a variety of metacognitive knowledge. If metacognitive knowledge

about reading is shown to be critical for the acquisition of reading skills, then educators may want to incorporate specific programs for teaching this information to children into reading curricula. The results of the present study demonstrate that beginning readers have a limited understanding of reading as a cognitive activity and certainly could profit from instruction regarding the means, goals, and parameters of proficient reading.

Chapter 2

Monitoring, Organizing, and Recalling Stories

Study 1 indicated that children have a limited understanding of the task dimensions and the need to apply strategies for reading. The purpose of this study was to replicate the findings of Study 1 and to relate children's knowledge about reading to their reading abilities and comprehension strategies. Children were presented a modified interview from Study 1 and were asked to perform several tasks involving story materials. The tasks involved constructing stories from a scrambled array of sentences, selecting the most important sentence from a story, and studying and recalling simple stories. In order to evaluate the qualitative characteristics of performance on tasks with story materials, it was necessary to specify the nature of the organization structure of stories. Rumelhart (1975) specified suprasentential relationships to characterize the structure of simple myths and fables, while other researchers have expanded his structural characterizations and related them to cognitive structures for internal representation of story parts (Mandler and Johnson, 1977; Stein and Glenn, 1978). Mandler and Johnson (1977) parsed stories into six general "grammatical" units: Settings, Beginnings, Reactions (Internal Response), Attempts, Outcomes (Consequences), and Endings. Settings introduce characters and/or the time and locale of the story. The Beginning consists of one or more events that cause the protagonist to respond. The protagonist's initial response is an internal reaction (Internal Response) that is followed by a simple action or by an attempt to reach a goal (Attempt). The Outcome is a direct consequence of an Attempt and the Ending is the close of an episode or story. The Ending, unlike an Outcome, is not necessarily tied to a particular Attempt, but may also refer back to the Beginning or to the protagonist's Internal Response. An episode may consist of a combination of the story grammar units and generally contains only one Beginning and one Ending. A story consists of one or more episodes.

To investigate the role of grammar units in encoding and retrieval, Mandler and Johnson (1977) examined first grader's, fourth grader's and adult's recall protocols from simple stories. In general, the adults recalled more than fourth graders, who recalled more than first graders and the six grammar units were differentially recalled by both children and adults. Settings, beginnings and consequences were recalled well by all groups while endings and internal responses were recalled poorly. The only age by grammar unit interaction was that adults recalled attempts well, while young children recalled them poorly. Mandler and Johnson concluded that, "even the younger subjects are sensitive to the structure of stories and have schemata which organize retrieval in a fashion similar to adults (p. 145)."

In this study, the use of grammar units as a qualitative measure of task performance also served the purpose of replicating Mandler and Johnson's (1977) study on the type of grammar units recalled by children and allows an examination of the utility of grammar units for other cognitive tasks.

Method

Subjects

Subjects were 16 third graders and 16 sixth graders balanced for sex and selected without regard for reading ability. Third grade and sixth grade age means were 8-10 and 12-7 respectively and ranged from 7-10 to 9-11 for third graders and from 12-0 to 13-10 for sixth graders. Standardized reading scores from the Stanford Test of Academic Skills were obtained for each child. Stanine scores for each grade ranged from 2 to 9. In addition to children, 50 Purdue University students from an introductory developmental psychology course voluntarily participated in the ranking task.

Materials

Interview. Twenty-four questions were organized into a script format similar to the interview in Study 1. Seventeen questions were selected from Study 1 in order to replicate the major findings from that experiment and seven new questions were added to provide metacognitive information for comparisons with other tasks. The items were designed to assess children's knowledge about person, task, and strategy variables. Questions about personal limitations, reading goals, study skills, skimming, resolving comprehension failures and knowledge about structural cues were included.

Rearrangement and rating. The stories used for the rearrangement and rating tasks were adapted from Mandler and Johnson (1977) and from Stein and Glenn (1978). The Fox and Bear story and the Boy Story were chosen for their familiarity for both age groups, for their short length, and because they had previously been parsed according to story grammars. Each story selected for the rearrangement and ranking tasks was composed of two episodes, with one of each six grammatical units per episode.

For the rearrangement task, each sentence was typed on a 8 1/2 x 1 inch laminated card. On the upper right corner of each card a letter of the Greek alphabet was written in order to aid scoring by the experimenter. For the rating task each sentence was typed on one line of a 8 1/2 x 11 sheet of paper with triple spaces between each sentence. Each sentence was preceeded by a black line on which children could enter a number. Stories were presented on separate sheets of paper.

Study and recall. For the study and recall task, a 24 sentence story entitled Judy's Birthday was selected from Stein and Glenn (1978) and adapted to fit Mandler and Johnson's story grammar. Several sentences were added to the story so that four episodes, each consisting of one instance of each grammatical unit could be included. For the study task, each sentence was prepared in the same manner as sentences for the rearrangement task except that sentences were numbered on the reverse side of the card instead of containing Greek letters. The number of each card corresponded to the correct serial position of the sentence. The story

was also typed on a single sheet of paper in the same format as stories for the rating task. This sheet was used to indicate the six best sentences to study.

Procedure

Children were tested individually in a quiet room at school. Each child was seen on two different days, with a seven day interval between days. On day 1, children were first presented with 12 scrambled sentences which they reorganized to form a coherent story. Following rearrangement, children rated each sentence for its level of importance to the meaning of the story.

On day 2, children were presented with a 24 sentence story to study in order to remember later. After the children indicated that they were finished studying, they were interviewed about their knowledge of reading, memory, and story parameters. Following the interview, children were asked to recall as much of the previously studied story as they could, and were subsequently asked to select the six best sentences to study. In general, the sessions were relaxed and informal and lasted about 20 minutes for each day and for each group. Detailed descriptions of the procedures are presented in the subsequent sections for each task.

Interview. Interview procedures were identical to procedures for Study 1.

Story construction and ratings of importance. For the rearrangement task, the child and the experimenter were seated by a table with the deck of scrambled sentences. It was explained to each child that one sentence was written on each card, and that the sentences go together to form a story. They were told that the sentences were "all mixed up" and their task was to put them together to make a story. The shuffled deck was then given to a child, who was instructed to read each sentence aloud and place it face up on the desk, with the first sentence placed at the top, second sentence placed below the first, etc., until all sentences were placed in a column in the order in which they read. The child was then directed to construct the best sentence order to form a story, and to tell the experimenter when the story was complete and correct. After the child indicated that the task was finished, he was instructed to check the sentence order and to change the arrangement if any errors were found. The total time to arrange and to check and rearrange the story was recorded with a stop watch. Throughout the task, the experimenter recorded each successive choice and placement and recorded the final sentence order.

After the children had arranged the first story, they were given the sheet of paper with sentences listed in their proper order. The experimenter explained that some sentences are more important for the meaning of the story than others, and then directed the children to place a check mark next to the four most important sentences. After the four sentences were selected, children were told to place a number 1 beside the most important sentence of those four, place a 2 by the next most important, etc., until the four sentences were ranked. Children were then told to check the four next most important sentences, then number them 5-8. After the eighth rank

was given, children were told to assign numbers 9-12 for the remaining sentences. Following the last ranking, children were presented with the second story for rearrangement and the above procedure was repeated. The order of story presentation was counter-balanced for each grade group.

Study and recall. For the study task, a child and the experimenter were seated at a table with the story sentences placed face down in front of them. It was explained to the child that sentences of a story were written on the reverse side of the cards and that the sentences were properly ordered. They were informed that after reading the story they would have the opportunity to study it and would then be asked to recall the story meaning. They were also informed that a verbatim recall would not be required. The child was then instructed to read aloud each sentence in proper order and to turn it face down after reading and were subsequently directed to study the sentences so that as much of the story as possible could be remembered later. They were told that the only study restriction was that each sentence had to be placed face down after examination. Throughout the reading and study sections of the task, only one sentence at a time was face-up and all others were face down. The experimenter recorded the sentences that were chosen for study and the order in which they were chosen. After children indicated that they were finished studying, the interview was administered. Following the interview, children were directed by the experimenter to "tell me as much of the story as you can remember." After children stopped reciting, they were asked if they could remember any more of the story. The free recall and the interview responses were recorded on tape.

After recall, children were given the sheet of paper with the list of sentences from the story and were asked to check off the six best sentences to study.

Scoring

Interview. In general, scoring procedures for the interview task were identical to Study 1. In addition, each individual was assigned a score of 1 or 0 for each item, with 1 indicating a sophisticated, adult-like response and 0 indicating a nonsophisticated response. Interview scores were determined by two judges who reviewed the general response categories for each item and assigned a score of 1 or 0 based on their intuitions about efficient reading. The percent of agreement between judges was 96% and the one disagreement was resolved through interjudge discussion. An individual's overall score was determined by summing across items.

Story construction. A number of measures were recorded for the rearrangement task. The number of sentence placements and the total time to construct the story were obtained. Individual scores were also derived from the number of sentences placed in their correct serial position and the number of sentences placed in their proper paired sequence, regardless of the serial position of the pairs.

Ranking. Individual scores for the ranking task were computed

according to whether they agreed with adult norms. Children were assigned a score of 1 for each sentence that was ranked in the same third as the adult rankings. A child's overall score was determined by summing the number of adult-like ranked sentences.

Study and recall. Two measures of the study task were taken; total study time, and the total number of times sentences from the story were examined. For the recall task, sentences were scored as correctly recalled if the child's response contained the essential meaning of the originally presented sentence. If children transformed grammatical or syntactical components of the sentences, such as verb tense or word order, or substituted synonyms or phrases that were semantically equivalent to the original words and phrases, and these transformations preserved the original sentence meaning, the sentence was scored as correct. If a child's recall included sentences or phrases that were related to the story, such as logical inferences and elaborations that were not explicitly stated in the story, those sentences and phrases were scored as elaborations. Reported sentences that were unrelated to the story were scored as irrelevant. Two judges independently scored the recall protocols and 88% of the reported sentences were identically scored by both judges. The greatest amount of variance between judges was attributed to distinguishing elaborations and irrelevant responses. The percent of agreement between judges for determining whether a sentence was recalled or not recalled was 96%. Each individual's total recall score did not include elaborative or irrelevant responses but was determined by the number of sentences that were correctly recalled.

Results and Discussion

Interview

The interview results are presented in basically the same format as results from Study 1. A comparison between items included in both experiments will be presented, after the data presentation for the interview items of this study.

Person Variables.

A. Specialized skills. A reader's knowledge of the type of skills necessary for reading may serve as a guide for the development of his own reading skills. To determine whether children perceive a proficient reader as one who has acquired a specific set of reading skills or as one who is academically superior in general, children were presented with the following situation:

1. "The other day I talked with a boy/girl who was really good at arithmetic. Then I asked him/her if he/she was a good reader. What do you think he/she said? Yes, that's right, why do you think so?" (Questions were phrased in terms of the same sex of subjects.) Seventy-five percent of the third graders and one of the sixth graders reported that someone good in arithmetic would also be a proficient reader. Eight-eight percent of the sixth graders and 19% of the third graders reported that someone good in arithmetic would not necessarily be a good reader. An analysis of the responses yielded a significant age relationship, χ^2 (1) = 15.95, $p < .001$.

Two sixth graders and one third grader reported that the person's reading ability would depend on other factors and their responses were not entered into the chi square analysis. Justifications for responses indicated that sixth graders perceived reading and arithmetic as separate activities requiring different skills while the third graders who responded "yes" indicated general intelligence factors or responded with "I don't know". As in the first interview, older children reported that reading requires special skills, while younger children did not.

B. Limitations. Other person variables which may affect reading development are environmental opportunities and reading related personal abilities and limitations. In order to assess children's knowledge of the affects of environmental opportunities and limitations, the following situation was presented:

2. "Suppose there were two boys named John and Alan who came from different homes. John's parents were wealthy and John had lots of toys and books. Alan's parents, though, were poor and didn't have many books at home. Do you think one of these boys was a better reader st school? Which one? Why?"

Sixty-three percent of the third and 25% of the sixth graders reported that the rich boy would be a better reader, while 63% of the sixth graders and 25% of the third graders reported that the poor boy would be a better reader. One third grader and two sixth graders thought that they would have equal reading abilities. "Same" and "poor boy" responses were combined and compared against "rich boy" responses to yield the same significant age relationship, X^2 (1) = 3.88, $p < .05$. The most common justification for the poor boy being a better reader (70% of the sixth and 50% of the third graders) was that he would be more motivated to read than the rich boy, who would be more interested in "playing around." Several children's justifications also mentioned that the poor boy could obtain books through a library.

In order to determine children's awareness of other ability limitations or advantages they were asked:

3. "Some people can remember better than others. If Alan could remember more names, places and facts than John, would that help him read better? Why?"

The majority of third and sixth graders (69% and 81% respectively) thought a good memory would or could aid reading but more sixth than third graders reported appropriate justifications for their responses. Nine of 13 (69%) sixth graders stated that memory could help reading by locating main ideas, would facilitate rereading, and other strategic responses, while only 4 of 11 (36%) third graders reported similar justifications. Most third grade justifications were just a restatement that someone with a good memory can read better or that he can remember better. While most children were aware of the disadvantages of limiting factors on reading, more older than younger children specified ways to overcome obstacles and specified how limitations inhibited reading.

Task Variables.

A. Purpose. Reading processes may be partially determined by the reader's preceived purposes and goals of the task. In order to determine whether children realize the importance of knowing a task's goal, the following situation was presented:

4. "The other day I asked Bill to read a story and then to tell me what he read. Before he started reading, though, he asked me if I wanted him to remember the story word for word or just remember the general meaning. Why do you think he asked me that?"
Approximately the same percent of sixth graders (38%) as third graders (48%) responded that knowing the goal of a task would help the reader, but they didn't specify how it would help. All of the remaining sixth graders reported that they would study or recall the story differently according to the task goal, while 67% of the remaining third graders (38% of all the third graders) reported irrelevant answers or replied, "I don't know." A comparison of the differential study category with the don't know category replicated the response pattern for this item in Study 1 and yielded a significant age relationship, Fisher's exact probability < .05. Sixth graders are more likely than second and third graders to spontaneously report that different means are required to accomplish different goals.

In order to determine whether children were aware of the differential difficulty of the goals mentioned in question 4, children were asked:

5. "Which would be easier to do, read word for word or for general meaning?"
As in Study 1, all of the sixth graders and 81% of the third graders reported that reading for the general meaning is an easier task. As a more direct assessment of whether children would employ different means to different goals, they were asked:

6. "If you had to remember all the words, would you read any differently than if you had to remember the meaning?"
Replicating the earlier response pattern, 94% of the sixth graders and 63% of the third graders responded that they would read or study differently for the different tasks, while 38% of the third graders reported that they would do nothing differently. Even with this direct question regarding employment of different means to different goals, the pattern for more sixth than third graders to indicate different strategic awareness was significant, Fisher's exact probability < .05.

To further investigate children's differential means employment for specific goals, the following question was presented:

7. "Would you do anything differently if you had to remember the meaning of a story a week later instead of remember it on the same day?"
Most children at each grade level responded positively. Sixty-three percent of the third graders and 88% of the sixth graders reported that they would study differently while 31% of the second graders and 13% of the sixth graders reported that they would not do anything differently

for the different goals (one third grader responded, "I don't know").

B. Test Mode. Another reading relevant task demand is the test mode. In order to assess whether children realized the effects of this variable they were asked:

8. "After Bill read the story I asked him some questions. Sometimes I asked Bill to tell me if a certain sentence was in the story. Other times I asked him to tell me in his own words what happened. Which question would be easier -- to tell about the story in his own words or to recognize the sentences from the story?"
Seventy-eight percent of the sixth graders and 50% of the third graders reported that recall was easier than sentence recognition while the remaining subjects report that sentence recognition was easier. The grade relationships were not significant, χ^2 (1) = 1.20, $p < .05$.

C. Structural Cues. The readers knowledge about structural cues may serve as a guide to comprehension. Several questions were constructed to tap children's knowledge of the characteristic structure of paragraphs and stories. They were asked:

9. "What makes a story easy to read?"
Subjects reported a wide variety of physical and orthographic features such as small words, easy words, and large print as characteristics of easy stories. No developmental differences were evident.

In order to investigate children's awareness of paragraph structure, they were asked:

10. "Is there anything special about the way sentences go into a paragraph or story?"
Most of the sixth and third graders (94% and 69% respectively) reported that sentences are in some way organized to make up a paragraph. Justifications ranged from indicating that the sentences are concerned with the same topic to indicating that sentences are organized in a temporal sequence. Unlike responses in the first experiment, neither the original response, nor the justifications yielded significant grade differences.

In order to investigate children's awareness of specific paragraph parameters, subjects were asked:

11. "What does the first sentence usually do for a paragraph or story?"
and

12. "What does the last sentence do?"
Converting the response frequencies in Table 7 into percentages results in all of the sixth graders but only 44% of the third graders reporting the introductory and semantic nature of the first sentence of a paragraph. Young children were less aware of the semantic function of the first sentence, Fisher's exact probability < .005.

Table 7. Characteristics of First and Last Sentences in Paragraphs

Grade	Semantic Characteristics: Introduce or Summarize Topic	Semantic Characteristics: Temporally Begin or End	Nonsemantic Characteristics: Orthographic	Nonsemantic Characteristics: Don't Know And Irrelevant
		First Sentence		
Third	7	4	2	3
Sixth	16	0	0	0
		Last Sentence		
Third	6	5	0	5
Sixth	14	2	0	0

In response to question 12, 88% of the sixth graders and 38% of the third graders reported the semantic function of the last sentence (conclusion, contains more information). Most of the third graders reported temporal features or that they didn't know the special function of the sentence. Significantly more sixth graders than third graders were aware of the semantic properties of the first (Fisher's exact probability < .005) and last sentence (χ^2 (1) = 6.53, $p < .05$) of a paragraph.

To investigate children's awareness of specific functions of sentences, independent of paragraph structures subjects were asked:

13. "Are some sentences more important than others?"

14. "How can you tell which sentences are more important for the meaning of a story?"

Virtually all the children reported that some sentences are more important than others but 81% of the sixth graders and only 44% of the third graders generated an appropriate semantically related strategy for determining important sentences (e.g., sentences that tell the most, are most related to the story, etc.). The remaining subjects either responded "don't know" or gave nonstrategic or nonsemantic reports such as "by just reading", "by exclamation point", etc. Significantly more sixth than third graders reported semantically strategic methods of determining important sentences, χ^2 (1) = 4.71, $p < .05$. When children were asked if sentences differ in importance (13) or organization (10) they all say yes, but only older children can specify the organization of sentences in stories or how to discriminate important sentences.

Strategy Variables.

A. General Study. The strategies one employs to accomplish specific reading goals may partially determine whether those goals are met. To investigate what reading and study strategies children can generate for the goal of remembering information, they were asked:

15. "How do you study a story so you remember it?"

Eighty-eight percent of the third graders but 50% of the sixth graders indicated that they would reread the entire story. Fifty percent of the sixth graders and 12% of the third graders generated other types of strategies, such as self-testing, studying the important parts, reading slowly and having others ask questions. The grade relationships were not significant, χ^2 (1) = 3.63, $p < .10$.

Children were asked:

16. "Do you read any differently if you have to remember a story later? What do you do?"

Ninety-two percent of the sixth graders (11 out of the 12 children who were asked the question) and 67% of the third graders responded that they would read differently if they had to remember a story later. The grade differences were not significant.

When asked:

17. "Does it help to make notes or tell somebody about the story or do you just think about it?"
The majority of the children (85% of the sixth graders and [illegible] of the third graders) replied that it would help to take notes or to tell someone about the story. Also, all children replied yes to the question,

18. "Do you ever reread a story?"
but sixth and third graders had different reasons for rereading. Thirty-eight percent of the third graders and 25% of the sixth graders reported that rereading helps them remember the story. Sixty-nine precent of the sixth graders (as opposed to 12% of the third graders) reported that they would reread to acquire more information from the story, while 50% of the third graders (and only one sixth grader) reported that they would reread because they liked the story. The trend for more sixth graders to reread for more information while third graders reread because they like the story was significant, Fisher's exact $p < .05$.

b. Recursive Operations. To continue investigating rereading strategies children were asked:

19. "Do you think a good reader goes over and over what he reads or do you think once he reads it he remembers the story?"
Eighty-eight percent of the third graders but only 38% of the sixth graders reported that good readers only read a story once, while 12% of the third graders and 50% of the sixth graders reported that good readers review meterials after reading. The age differences were significant, χ^2 (1) = 9.15, $p < .01$.

C. Skimming. A strategy related to rereading and common to mature readers is skimming. To investigate this reading strategy, children were asked:

20. "If you had to read a story very quickly and could only read some of the words, which ones would you try to read?"
Ninety-four percent of the sixth graders and 44% of the third graders reported that they would skim for meaningful information (e.g., important words, most meaningful words, to be remembered words, etc.) while 50% of the third graders and only one sixth grader reported that they would attend to easy or familiar words while skimming. One third grader responded "I don't know." As in Study 1, significantly more sixth graders than third (or second) graders indicated that they would attend to the more informative words, χ^2 (1) = 6.07, $p < .01$.

After responding to question (19), subjects were told that the described activity was called skimming, and they were subsequently asked:

21. "Does skimming help you remember?"
Eighty-eight percent of the sixth graders and 31% of the third graders reported that skimming can aid memory while 69% of the third graders and 12% of the sixth graders reported that skimming does not facilitate remembering. Significantly more sixth graders than third graders realized that skimming can facilitate memory, χ^2 (1) = 8.31, $p < .01$.

D. Comprehension and Memory Failures. In order to determine children's awareness of methods for determining forgotten information, they were asked:

22. "If you were trying to tell someone about a story that you had read, but forgot part of it, how would you fill in the missing parts?" Eighty-eight percent of the sixth graders and 38% of the third graders reported that they would strategically reconstruct the story and/or use contextual aids to determine the forgotten information, while 56% of the third graders and 6% of the sixth graders reported nonstrategic resolutions such as think, try to remember and just remember. One subject from each group replied, "I don't know". The trend for sixth graders to activity construct and use structural cues more than third graders was significant, χ^2 (1) = 8.27, $p < .01$.

Determining the meaning of unknown words and sentences is a crucial aspect of reading. Even sophisticated readers encounter incomprehensible material and need to draw upon strategies to resolve those comprehension failures. In order to investigate children's awareness of their own methods for determining unknown words, they were asked:

23. "What do you do if you don't understand a word that you read?" Thirty-one percent of the third graders and 69% of the sixth graders reported that they would use a dictionary, while 44% of the third graders and 22% of the sixth graders reported that they would ask another person for help. The remaining subjects reported that they would sound-out or skip the word. Unlike the responses for this item in Study 1, item 22 yielded no significant differences between grades. The majority of third graders and sixth graders were able to generate a strategy for determining unknown words, while few third graders replicated the answers reported by the second graders in Study 1.

In order to determine how children resolve sentence comprehension failures they were asked:

24. "What do you do if you don't understand a whole sentence?" Sixty-three percent of the sixth graders but only 22% of the third graders reported semantically and contextually related strategies for determining sentence meanings, while 56% of the third graders and one sixth grader reported external resource strategies such as seeking help from others. Other responses included skip, don't know, sound-out, and try hard. As in Study 1, significantly more sixth than third graders reported semantic strategies, while more third graders than sixth graders reported that they would seek help from others, χ^2 (1) = 7.27, $p < .01$.

When asked:

25. "Do you ever have to go back to the beginning of a paragraph or a story to figure out what a sentence means?" Most children reported yes, but when asked how it would help to reread a paragraph, 63% of the sixth graders but only 22% of the third graders reported that they would utilize paragraph structures and contextual cues for resolving unknown sentences. On the other hand, 63% of the third graders and 22% of the sixth graders just reported that rereading would help without indicating

how. Two third graders and one sixth grader replied "I don't know." Comparing the number of children who responded with contextual and strategic strategies with the number of children who reported nonspecific aid, replicated the grade differences found earlier. Significantly more sixth graders were able to report the semantic and contextual cues that can be utilized for resolving sentence comprehension failures, χ^2 (1) = 4.25, $p < .05$.

Similarities and Disparities Between Interviews

In general, the interview items common to both studies yielded the same response patterns for the younger and older groups. Of the seventeen items of Study 1 that were included in this study, fourteen items yielded the same general response categories and the second and sixth grade response differences were identical to third and sixth grade response differences. For the other three interview items, response differences that were significant between second and sixth graders in Study 1 were not significant between third and sixth graders in this study. The disparity between the first two interview items was chiefly due to differences between second and third graders. Second graders in Study 1 were not aware of the structural order of sentences in a paragraph (item number 8) while sixth graders were. In this study, both third and sixth graders were able to report how sentences were organized to form a paragraph (item number 10). Second and third graders also differed in their responses concerning the resolution of unknown words. Forty percent of the second graders reported that they would sound-out unknown words and none of them indicated that they would use a dictionary. None of the third graders said that they would sound-out unknown words while 31% said they would use a dictionary. Second graders responded significantly different from sixth graders, while third graders did not. The third item that yielded different age differences between interviews did not stem solely from differences between second and third graders, but could also be attributed to different responses from the two samples of sixth graders. Sixty-three percent of the sixth graders in this study but only 25% of the sixth graders in Study 1 reported semantically oriented strategies for determining the meaning of an unknown sentence. In this study, only 6% of the sixth graders reported externally oriented strategies, while 55% of the sixth graders in Study 1 did so. Third graders also differed from second graders on this item. Thirty percent of the second graders could report no strategy for resolving sentence comprehension failures, while only 13% of the third graders could not report a solution. This was the only item on which general grade trends differed across interviews. Sixth and second graders differed on the ability to report a strategy, while sixth and third graders differed on the type of strategy (external or internal) generated.

In summary, 82% of the responses to interview items from Study 1 were replicated in this study. Of the remaining 18%, 66% of the disparities were attributed to differences between second and third graders responses, and reflect developmental differences rather than interview unreliability.

Story Construction Task

The number of sentence placements required to construct the story was

recorded for each child. Sixth graders had a mean of 12.75 placements and third graders averaged 12.60 placements. The analysis of variance on the number of sentence placements before a story was completely constructed yielded no significant grade or story effects and no significant grade x story interactions.

Accuracy scores for the story construction task were obtained by calculating the number of sentence sequences that children correctly paired, regardless of the serial position of the pairs. For example, if a child correctly placed the second sentence of the story after the first sentence but incorrectly placed the seventh sentence after the second sentence, the first-second pair would be scored as correct, while the second-seventh pair would be incorrect. Collapsing across stories, sixth graders correctly paired 49% of the sequences and third graders correctly paired 38%. A t-test yielded no significant differences between grades. A second score for accuracy was calculated by determining the number of sentences each subject placed in the sentence's correct serial order. Across stories, sixth graders placed 37% of the sentences in their proper positions and third graders placed 35% correctly. The grade differences were not significant. Figure 1 shows the percentage of times each sentence was accurately placed. The grade x sentence serial position analysis of variance on the number of times sentences were correctly placed indicated that the grade x sentence interaction was not significant, and that the main effect of sentences was significant, $F(11,341) = 22.4$, $p < .001$ for Fox and Bear and $F(11,341) = 11.32$, $p < .001$ for Boy Story.

A Newman-Keuls analysis of differences between sentence means indicated that the first sentence of each story was more accurately placed than any other sentence in the story ($p < .05$). In the Boy Story, the last two sentences were correctly placed significantly more often than the remaining sentences, with the exception of the first and second sentence. In the Fox and Bear story the second sentence and the last two sentences were placed accurately significantly more often than other sentences (except the first sentence). Combining stories also resulted in a significant sentence effect, $F(11,682) = 28.37$, $p < .001$, but since the sentence by story interaction was significant, $F(11,682) = 4.40$, $p < .001$, a Newman-Keuls test was not performed. In general, the first two and the last two sentences were placed more accurately than the middle sentences.

To analyze the accuracy of serial placement of grammatical units, the two instances of grammar units from each story were combined into a single score. For example, if both the endings of each episode from the Boy Story were placed in their correct serial position in the story (as the sixth and twelfth sentence), the ending unit would receive a score of 2. If only one ending was correctly placed, the score would be 1. A grade x story x grammar unit analysis of variance with repeated measures was computed. Only the main effect for grammar units was significant, $F(5,310) = 7.65$, $p < .001$. A Newman-Keuls test indicated that the settings were placed correctly significantly more than any other grammar unit, $p < .05$. No other units were significantly different.

In general there were no grade or story differences for accurate story

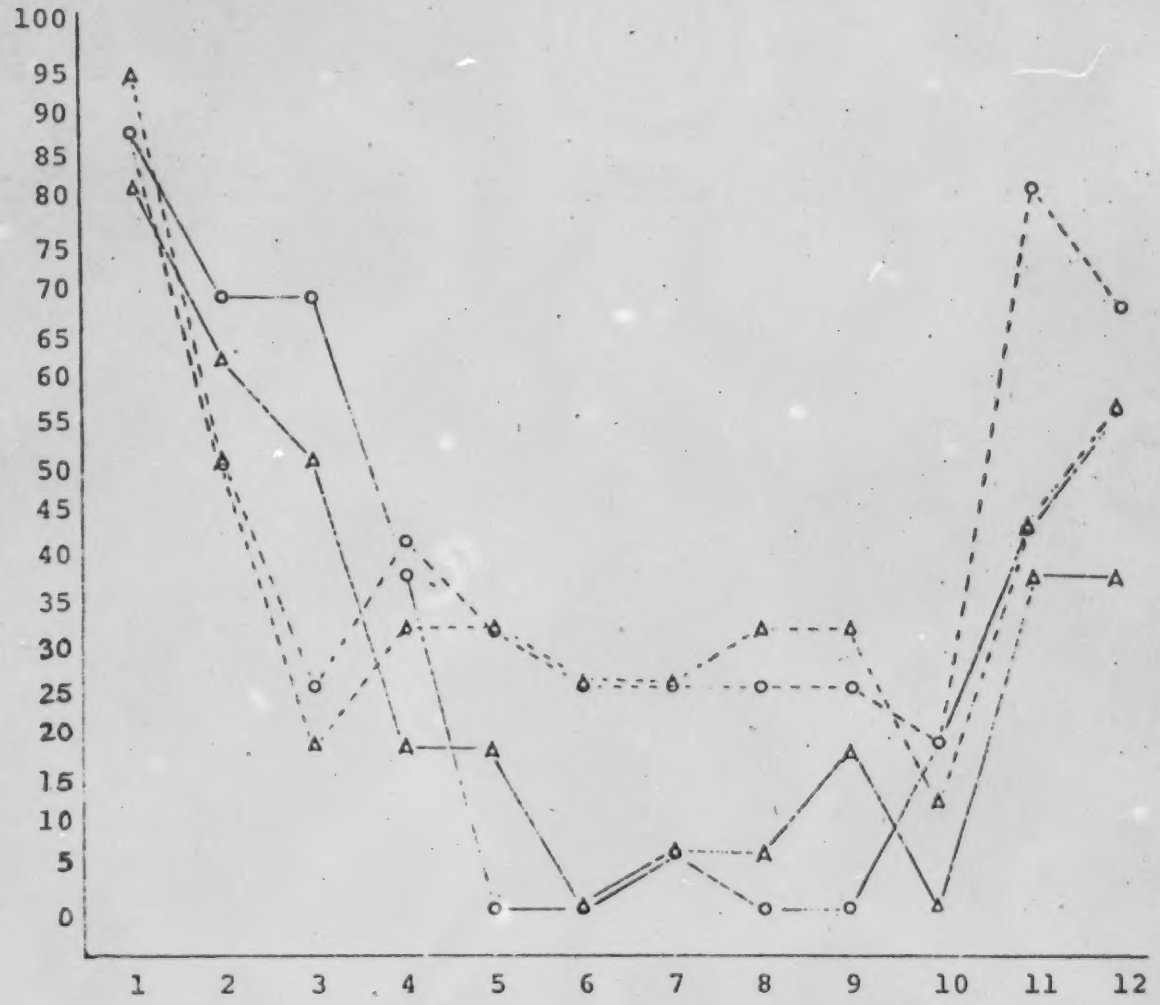


Figure 1. Percentage of third and sixth graders who placed each sentence in its correct serial position.

construction. The first and last sentences were more accurately placed than other sentences, and settings were placed more accurately than other grammar units.

Ratings of Importance Task

The Kolomogorov-Smirnov one sample test was used to analyze the probability that each sentence for each grade group was given a rating above or below that which would be expected by chance and the Kolomogorov-Smirnov two sample test was used to analyze rating differences between groups. All reported D and K values were significant at the .05 probability level.

Ratings of Importance. For the Boy Story sixth graders rated sentence 2 (a Beginning) as important (D_B = .33) and sentence 9 (an Internal Response) and 10 (a Setting) as unimportant (D_I = .40 and D_S = .54). For the Fox and Bear Story, sixth graders rated sentence 1 (a Setting), sentence 2 (a Beginning), and sentence 12 (an Ending) as important (D_S = .60 and D_E = .40), and sentence 6 (an Ending) as unimportant, D_E = .54. Third graders rated sentence 9 (an Internal Response) of the Boy Story as unimportant (D_I = .42). For the Fox and Bear Story, third graders rated sentence 1 (Setting), 3 (Attempt) and 12 (Ending) as important (D_S = .35, D_A = .40 and D_E = .52) and sentence 4 (Internal Response) and 6 (Ending) as unimportant (D_I = .46 and D_E = .44). The remaining 17 sentences for the sixth graders and 18 sentences for the third graders received highly varied ratings among subjects and resulted in no significant preferential ratings.

Adults showed more preferential ratings for stories than children did, χ^2 (2) = 6.75, $p < .05$. For the Boy Story adults rated sentence 3 (Attempt), 5 (Consequence), and 6 (Ending) as important (D_A = .27, D_C = .24 and D_E = .4) and sentences 1 (Setting), 4 (Internal Response), and 9 (Internal Response) as unimportant (D_S = .43, D_I = .36, D_I = .27). For the Fox and Bear Story, adults rated sentences 2 (Beginning), 4 (Internal Response), 11 (Consequence), and 12 (Ending) as important (D_B = .39, D_I = .24, D_C = .38, and D_E = .31), sentences 1 (Setting) and 3 (Attempt) as unimportant (D_S = .24 and D_A = .32) and sentences 8 (Beginning) and 9 (Attempt) as having intermediate importance D_B = .21 and D_A = .32).

A comparison of third and sixth grade ratings revealed only two differences. Sentence 2 (Beginning) of Fox and Bear was rated by sixth graders as more important (K_V = 8) and sentence 10 (Setting) of the Boy Story was rated more consistently as unimportant by the sixth graders (K_S = 8). Combining stories, adults rated 9 sentences differently than sixth graders and 8 sentences differently than third graders.

In summary, children's ratings for the importance of sentences was highly varied and yielded few differences between grade groups, but children were able to consistently rate 27% of the sentence. While adults' ratings were also varied, they were able to consistently rate 14 of the 24 sentences, and in many cases, their ratings differed from children's ratings. Few developmental differences were found within children, but many of the children's ratings were significantly different from those of adults. Also, no group indicated consistent serial position preferences or grammatical

grammatical unit preferences across stories. More rating preferences were exhibited for the Fox and Bear story than for the Boy Story indicating that rating sentences for importance was easier in the former than in the latter.

Study Task

The total number of times sentences were studied was calculated for subjects within each grade. The number of sentences studied varied greatly across subjects regardless of grade and the mean and standard deviation of the number of times sentences were studied was $\bar{x} = 16.5$; S.D. = 8.56 for third graders and $\bar{x} = 21.1$; S.D. = 10.82 for sixth graders. A t-test indicated no significant differences between grade means.

The average study time for sixth and third graders was 2.4 and 2.8 minutes respectively. The differences between grade means was not significant.

To analyze the effect of a sentence's serial position on the number of times it was studied, blocks were formed by combining two sentences. The number of times the first and second sentences were studied was combined for block 1, the third and fourth sentences were combined for block 2 etc. until 12 blocks were formed. In order to alleviate an inaccurate weighting for individual sentences, an individual's score for a particular sentence was 2 if he studied it 2 or more times. A sentence block x grade analysis of variance with repeated measures yielded a significant main effect of blocks, $F(11,330) = 2.24$m $p < .05$, but the only significant difference between individual block means was between the most studied block, number 6 and the least studied block, number 7 (Newman-Keuls test, $p < .05$). The main effect of grade and the grade by trial interaction were not significant. An analysis of variance of the grammar units resulted in no significant grade or trial effects and no significant grade x trial interaction.

In general, there were no grade differences for study time or number of sentences studied and the overall effect that some sentences were selected for study more often than others could not be explained by serial position effects or by story grammar unit effects.

Selection of the Best Sentences for Study

The number of times each sentence was selected as one of the six best sentences to study was computed and analyzed for serial position effects and for grammar unit effects on frequency of selection. For the serial position analysis, as for the study task analysis, sentences were blocked by sequential pairs. In the serial position block x grade analysis on the frequency of sentence selection the grade x block interaction was not significant but the main effect of blocks was $F(11,330) = 2.50$, $p < .01$. Block 2, consisting of the third and fourth sentences, was selected more often than block 7, 10, and 11, Newman-Keuls test, $p < .05$. No other sentence mean differences were significant. The grammar unit x grade analysis of variance on sentences selected for study also resulted in a nonsignificant grade x grammar unit interaction and a significant main effect of grammar unit, $F(5,150) = 3.30$, $p < .01$. A Newman-Keuls analysis

indicated that settings were selected as the best unit of study and were selected significantly more often than all other units, $p < .05$. No other unit mean differences were significant.

In general, no grade differences were observed for selecting the best sentences to study, and there were few serial position effects on sentence selection. Both age groups tended to select settings over all other grammar units as the best sentences to study to prepare them for recall.

Recall

The mean number of sentences correctly recalled by third and sixth graders was 13.75 and 15.06 respectively. Sixth graders produced a mean of 1.41 elaborations and third graders produced a mean of 1.31. A comparison of differences between means for sixth graders and third graders yielded no significant grade differences for sentence recall or for elaboration productions. Also few irrelevant responses were produced. The mean for sixth graders was .31 and for third graders the mean irrelevant response was .06.

For the serial position analysis, as in the study tasks, sentences were blocked in sequential pairs. The block x grade analysis of variance with repeated measures on the frequency of sentence recall yielded a significant main effect of blocks [$F(11,341) = 11.89$, $p < .001$] with a nonsignificant grade x block interaction but there was no pattern of first and last blocks being recalled better than middle blocks. While many block differences were significant, the strongest difference is that block 10 (sentences 19 and 20) was recalled less than all other blocks, Newman-Keuls test, $p < .05$.

A grade x grammar unit analysis of variance on the frequency of sentence recall indicated a nonsignificant grade x grammar unit interaction and a significant main effect for grammar unit, $F(5,150) = 12.27$, $p < .001$. A comparison of the grammar unit means indicated that internal responses were recalled less than any other grammar unit, Newman-Keuls, $p < .05$. There were no other significant differences between unit means.

In general, there were no grade differences in the number of sentences recalled or in the type of sentence recalled. Both grades recalled few internal responses than any other grammatical unit.

Intertask Relationships

To analyze the relationships between the tasks and to group the tasks into uncorrelated components, a principal component analysis was performed on accuracy scores for story construction, the number of sentences studied, the number of sentences recalled, total interview scores, and grade level. The analysis resulted in variables being grouped into three components that accounted for 76% of the variance between measures. In order to substantiate and clarify the components, the variables were rotated by the varimax method. Both story construction measures and recall scores were weighted above .68 for the first component. Total interview scores received a weight of .36 and all other measures were weighted less than .08.

For the second component, interview scores and grade level were weighted .82 and .93 respectively. Study number was weighted .82 and .93 respectively. Study number was weighted .49 and all others were weighted less than .27. The highest weight for the third component was .82 and was associated with the ranking measure. Study number was weighted by -.53, recall was weighted by -.32 and all other measures received weights less than .18.

In general, the different tasks were distributed into three groupings. Story construction performance and recall performance were the major contributors in one grouping. Metacognitive knowledge and grade level formed another group and agreement with adults' importance ratings and number of sentences studied formed a third group.

To analyze the predictive nature of the task measures on scores for a standardized reading test and on each other, a separate stepwise multiple regression analysis was performed on each dependent variable. The variable receiving the highest β weight; i.e., the best predictor, for the regression on standardized reading scores, was the number of sentences placed in their correct serial position, $F(1,30) = 25.86$, $p < .001$. The addition of other scores did not significantly increase the amount of variance accounted for by the sentence position score. The multiple regression analysis with recall scores as the dependent variable resulted in the other measure of story construction, the number of correctly paired sentences, being the best predictor, $F = 9.5$, $p < .005$. In general, accuracy in constructing stories from scrambled sentences was the best predictor of both recall and of standardized reading scores.

A multiple regression analysis with individual children's interview scores as the dependent variable indicated that the best prediction of interview scores was grade level, $F(1,30) = 54.54$, $p < .001$. The addition of recall scores into the regression equation yielded a significant increase in the multiple correlation coefficient, $F = 6.55$, $p < .016$. High grade level and high recall accuracy were good predictors of high interview scores.

In addition to examining the multivariate relationships of task measures with recall scores and reading scores, the simple relationships of metacognitive knowledge with the various task measures and with standard reading scores was determined. Overall scores on the interview were significantly correlated with grade level ($r = .79$, $p < .001$), recall ($r = .42$, $p < .05$), and both story construction measures ($r = .41$, $p < .05$ for sequential pairs; $r = .35$, $p < .05$ for serial position scores). Overall interview scores were not significantly correlated with reading scores, the number of sentences studied or sentence importance ratings.

Interview items were extremely diverse in content and varied across person, task and strategy variables, as well as varying within categories. In order to determine specifically which interview items best predicted the individual tasks, multiple regression analyses were performed on story construction and recall scores. A combination of two items resulted in the best prediction equation for recall scores, $r = .65$, $F(2,25) = 8.98$, $p < .001$. The item receiving the largest beta weight (4.84) was item #16; "Would you read any differently if you had to remember a story later?" and the item

receiving the second largest beta weight (3.39) was item #25; "Why would you reread a paragraph (if you didn't know a sentence in that paragraph)?" Those children, regardless of age, who reported that they would study a story if they were required to remember it at a later time and those who reported semantic and reconstruction justifications for rereading paragraphs to determine unknown sentences in a story were the children most likely to produce accurate story recall.

The best predictor of both measures of the story construction task was item #14, "How can you tell which sentences are more important for the meaning of a story?", $F(1,26) = 10.45$, $p < .01$, multi. $r = .54$ for serial position measure and $F(1,26) = 17.8$, $p < .001$, multi. $r = .61$ for the sequential pairs measure. Specifying how to select important sentences was also the best predictor of scores for the task of ranking sentences according to their degree of importance to story meaning, $F(1,26) = 4.72$, $p < .054$, multi. $r = .39$.

General Discussion

Young children in this study, as in the first study, were unaware of many parameters of reading. They were not sensitive to task dimensions or the need to invoke special strategies for different materials or goals. While young children recognized the usefulness of some strategies, they were unable to specify why or how the strategies could facilitate task performance. Many young children failed to generate appropriate strategies for specific goals, even though they had previously recognized many of the appropriate strategies. Although young children were aware of limitations such as opportunity to read, they did not report neutralizing factors such as motivation for overcoming those obstacles. Both third and sixth graders were aware of the fact that sentences are organized in paragraphs, but the younger children were insensitive to semantic properties of first and last sentences. Third graders were less sensitive to strategies required by different reading and memory goals. They reported fewer study techniques than older children and were not as accurate in coordinating particular strategies with task goals. On the other hand, older children were aware of the existence of various reading strategies and were sensitive to when and how to use them.

While children's metacognitive knowledge about reading and memory increased with age, none of the performance tasks resulted in significant developmental trends. Third and sixth graders were equally accurate at constructing stories and they recalled the same number of sentences. Grade level was not related to the type or number of sentences rated as important, although children's ratings did differ from adult's ratings, in both number and magnitude. Third and sixth graders did not significantly differ in time spent studying nor in the number of sentences studied, and also did not differ in sentences chosen as the best units to study. In the story construction task, both age groups accurately placed the first two and last two sentences more than other sentences and also accurately placed settings. Settings were also selected as the best grammatical units to study, and internal responses were recalled less than other grammar units. Settings were more accurately placed in a story and were selected as the best unit to study but weren't recalled, rated as important or

studied more than other units.

Children's awareness of memory and reading parameters was positively correlated with story construction performance and with recall performance, but were not related to standardized reading scores, the number of sentences studied or sentence importance ratings. These correlational relationships were reflected in the way task measures fell into relational groups. Grade and interview scores formed one group, story construction scores and recall formed a second group, and rated importance scores and study measures formed a third group. When task performance scores were considered in a multivariate context, story construction was found to be the best predictor of standardized reading scores and of recall scores.

In this study nine year old children could recall, construct and study simple stories in the same fashion as 12-year-olds. Stories were chosen for their high familiarity and easy readibility for even the youngest children and these factors certainly contributed to the lack of age related performance differences. Similarly, the amount of study behavior that could be exhibited during the study task was restricted by the task itself. The study behavior applicable to the task (rereading) was exhibited by both young and old children, but the task did not allow the implementation of, or at least the detection of, more semantically related study strategies.

On the other hand, ranking important sentences in myths and simple narratives is extremely difficult, even for adults. This task difficulty may have resulted in few age differences on the ranking task.

With the exception of the restrictions for study behaviors, the lack of age related differences allows an examination of process related performance differences that are somewhat independent of chronological age. Performance on particular tasks could be evaluated in terms of the amount and type of metacognitive knowledge children expressed.

An individual's metacognitive knowledge about processes, strategies, and goals that are relevant to task accomplishment were found to predict performance on that task. Knowledge of the need for strategies to aid delayed recall was related to recall performance and specifying strategies for selecting important sentences was related to accurate story construction as well as to accurately ranking sentences by their order of importance. For these tasks, metacognitive knowledge was a better predictor than grade level.

Chapter 3

Comprehension Monitoring in Good and Poor Readers

An important aspect of cognitive development in school age children is the ability to generate and apply problem-solving strategies in a deliberate manner. For example, when six or seven year olds are asked to remember groups of pictures, words, or sentences, they often fail to produce effective mnemonic strategies spontaneously (Brown, 1975). Strategy "production deficiencies" of this sort are symptomatic of young children, learning disabled children, and poor readers on a variety of cognitive tasks (Paris & Lindauer, 1977; Torgesen, 1977). These groups of children do not transform the stimuli into meaningful problems that can be readily analyzed, integrated, and recalled because they fail to invoke appropriate strategies.

Failure to recruit active strategies has a devastating effect on the development of reading proficiency. Although reading involves many perceptual and cognitive skills, a crucial acquisition is the ability to construct meaning from the printed word rather than simply identify and pronounce words. Poor readers often concentrate on decoding individual words and do not try to make sense of what they read (Smith, 1975). While this may reflect children's and teacher's decoding goals during beginning reading, it also seems to reflect a failure to recruit comprehension strategies of monitoring the meaning of the message. For example, fourth-graders identified as poor readers were not disrupted in their oral reading by substitutions of inappropriate words within sentences (Isakson & Miller, 1976). Good readers attend to meaning more than decoding and have tactics for keeping track of the sense of the message. Clay (1973) observed that good readers self-corrected their errors during oral reading at a much higher rate than poor readers. The ability to monitor and correct comprehension during reading appears to be a crucial difference between good and poor readers (Ryan, 1979).

The purpose of the present study was to examine the differences in comprehension monitoring between good and poor readers in detail. We asked children to read stories that contained anomalous words and phrases and measured monitoring in two ways. First, we recorded self-corrections and hesitations during oral reading as an index of spontaneous monitoring. Second, we directed children to underline parts of the story that they did not understand. This second measure tested whether poor readers could detect the anomalous information when instructed thereby implicating the failure to monitor spontaneously during oral reading as a strategy production deficiency. We also assessed comprehension and memory for the stories in order to determine the relationship between comprehension monitoring and story understanding. A subsidiary issue was whether the directed monitoring would result in improved comprehension and recall.

Method

Subjects

Thirty-two fourth graders from rural Indiana schools were subjects. Two groups of 16 good and poor readers, with equal sex representation, were

formed on the basis of test scores derived from the achievement series of the SRA Assessment Survey. The mean grade equivalent reading score for the total populations was 4.1 and the good and poor reader groups were defined according to deviations from this mean. The mean of the poor reader group was 2.8 (SD = .68, range = 1.0-3.4). The mean grade equivalent reading score for the good reader group was 5.4 (SD = .36, range = 4.8-6.2). In order to match children on nonreading school achievement, each poor reader was matched with a good reader of the same sex on the basis of mathematics achievement scores from the SRA Survey. Although we tried to match each pair of subjects within .4 grade equivalent math scores, two pairs differed by .6. The mean grade equivalent math scores for the poor reader group was 3.7 (SD = .37, range = 3.1-4.2) and the mean for the good reader group was 3.8 (SD = .43, range = 3.1-4.3). The mean age of the poor readers was 10.4 years (SD = .64, range = 9.7-11.5) while the mean age of the good readers was 10.1 years (SD = .26, range = 9.6-10.5). Thus, the two groups differed significantly on reading achievement but were matched for mathematics scores, ages, and sex.

Materials

The stimulus passages consisted of two third and two fifth grade level stories (and their corresponding sets of eight comprehension questions) selected from the Spache (1972) Diagnostic Reading Scales. Each story was modified by replacing two nouns with phonologically acceptable nonsense words (e.g., klids, kales) and by rearranging the words within two clauses to produce non-meaningful phrases. The four nonsense words and phrases were scattered throughout the stories with the stipulation that none of the changed information directly affected the answers to the eight comprehension questions.

Procedure

The reading tasks were administered to individual children in a quiet room of the school. The sessions were informal and lasted approximately 25 minutes. The tasks were described to children as reading and memory games. Each child read aloud one third and one fifth grade level story in the control condition first and the remaining third and fifth grade level stories in the treatment condition. In the control condition, children were instructed to read the stories aloud carefully and to try to remember them because they would be asked questions about each story later. Following the control stories, children were instructed that it helps to pay attention to what the story means and to the parts of the story that don't make sense. They were provided a pencil and told to underline any of the words or sentences in the story that they did not understand. Children were told that this underlining might help them answer the questions about each story. Following the presentation of all four stories and their questions, children were asked to recall as much of each story as they could. Recall was prompted by the title of each story and followed the same order as presentation. The orders of stories was counterbalanced within and across conditions and each child within a matched pair received the same story order.

Measures

There were four dependent variables of interest in the comparisons between control and treatment conditions and between good and poor readers. Spontaneous comprehension monitoring was assessed through children's repetitions, hesitations, and self-corrections during oral reading on the control stories. The experimenter recorded each of these events as children read aloud. The second measure of monitoring was the number of words and phrases underlined by children in the treatment condition. This is a more direct measure of children's monitoring abilities since it was instructed and presumably does not reflect decoding errors to the same degree as oral reading corrections. The third dependent variable was the number of comprehension questions answered correctly by each child for each story.

The fourth measure was free recall. Children's recall was transcribed verbatim from the tape recorded sessions and scored according to the number of clauses recalled from the story. For scoring purposes, each story was partitioned into clause units and recall of a clause was scored correctly if a child reported the exact words or close synonyms for the subject, verb, and noun phrase of each clause. Two judges scored all protocols and resolved the few questionable cases mutually. In order to compare recall across stories, the number of clauses correctly recalled were converted to percentages of each stories' total number of clauses.

Results

The percentages of anomalous words and phrases for which children hesitated, repeated, or self-corrected was calculated for each group and story. There were no story differences within difficulty levels and so stories were collapsed into third and fifth grade level stories. The mean percentages of monitoring responses are shown in the top of Table 8. These data were subjected to a Group (2) x Sex (2) x Unit (2) x Difficulty (2) analysis of variance with repeated measures on the last two factors. Anomalous phrases were noticed and corrected significantly more often than anomalous words by both groups of readers, $F(1,28) = 42.60$, $p < .01$. No other main effects were significant and the only significant interaction was Group x Unit x Difficulty, $F(1,28) = 4.71$, $p < .05$. The source of this interaction was traced to the different patterns of monitoring within units of different difficulty. Poor readers noticed more anomalous words in the third grade stories than good readers but were poorer in detecting all other anomalous information ($ps < .05$). Spontaneous monitoring of incomprehensible information was considerably inferior for poor readers on fifth grade stories. Even though these stories were beyond the poor readers' usual abilities, they did not actively monitor or correct nonsense words and phrases. It should be noted, however, that both groups of readers corrected spontaneously less than 40% of the nonsense words and phrases. Either decoding the printed words was a major goal of children's oral reading or they were often oblivious to the meaning of sentence constituents.

Poor readers' lack of monitoring was not due to a lower frequency of monitoring responses overall, though. The incidence of monitoring acceptable words and phrases in the stories was also calculated. Poor readers noticed or self-corrected an average of 2.3 good words in each third grade

Table 8

Mean Percent Monitoring Responses

During oral reading

	Units			
	Words		Phrases	
	Third	Fifth	Third	Fifth
Poor Readers	31.3	6.3	50.0	43.8
Good Readers	12.5	28.1	68.1	62.5

During Directed Monitoring

Poor Readers	18.8	18.8	48.9	21.9
Good Readers	25.0	25.0	78.1	62.5

story and 3.2 acceptable words in fifth grade stories. Good readers monitored 1.3 and 2.5 words respectively. In a Group (2) x Sex (2) x Difficulty (2) analysis of variance, only the difficulty factor was significant, $F(1,28) = 4.90$, $p < .05$. Both groups of children were monitoring the difficult stories more frequently but they did not differ on levels of monitoring. Poor readers failure to notice anomalous information was not due to lower absolute levels of monitoring, but to less accurate comprehension checking.

Directed underlining

There were no differences between stories within each level of difficulty and the frequencies of underlining were summed over stories. The percentages of anomalous words and phrases underlined are shown in the bottom of Table 8. These data were subjected to a Group (2) x Sex (2) x Unit (2) x Difficulty (2) analysis of variance. Significant main effects were obtained for Group, $F(1,28) = 2.00$, $p < .01$ and Unit, $F(1,28) = 17.31$, $p < .01$ indicating that poor readers underlined nonsense information less often than good readers and that both groups underlined more anomalous phrases than words. There was also a significant Group x Unit interaction, $F(1,28) = 4.11$, $p < .05$ due to the large difference between groups on underlining phrases. Good readers recognized 70% of the incomprehensible phrases while poor readers only noticed 34%. Again, poor readers failed to check the meaningfulness of phrases (particularly on difficult stories) to the extent that good readers did.

Three other facts should be noted about these data. First, both groups did not underline many anomalous words and the good readers were surprisingly poor at detecting them. Second, poor readers actually underlined more legitimate words and phrases than good readers (28 vs. 6) so that the less accurate monitoring of poor readers was not due to a lower absolute frequency of underlining. Third, only three poor readers and one good reader failed to underline some anomalous information indicating that the effect is not due to a few subjects.

Comprehension questions

Eight questions from the Spache stories were asked to each subject following each story. The percentages of errors for each group, condition, and level of difficulty (summed over stories again) are shown in Table 9. These data were subjected to a Group (2) x Sex (2) x Condition x Difficulty (2) analysis of variance. Significant main effects were obtained for Group, $F(1,28) = 22.93$, $p < .01$ and Difficulty, $F(1,28) = 113.94$, $p < .01$ indicating that poor readers made more errors than good readers and fifth grade stories were more difficult to understand for all children. The significant Group x Difficulty interaction, $F(1,28) = 21.54$, $p < .01$, indicates that good and poor readers were both highly accurate in their answers to third grade story questions while the poor readers made many more errors on the difficult stories. The significant Condition x Difficulty interaction, $F(1,28) = 3.98$, $p < .05$, indicates that comprehension improved in the underlining condition but mostly for the fifth grade stories.

Table 9

Mean Percent Errors on Comprehension Questions

	Condition			
	Spontaneous Monitoring		Directed Underlining	
	Third	Fifth	Third	Fifth
Poor Readers	13.3	55.5	10.9	46.1
Good Readers	8.6	28.9	6.3	16.4

Free Recall

The percentages of clauses correctly recalled from stories were subjected to a Group (2) x Sex (2) x Condition (2) x Difficulty (2) analysis of variance. Means are displayed in Table 10 and significant main effects were obtained for Group, $F(1,28) = 18.40$, $p < .01$; Difficulty, $F(1,28) = 156.01$, $p < .01$; and Condition, $F(1,28) = 4.44$, $p < .05$; indicating that good readers recalled more than poor readers, a higher percentage of clauses were recalled from the third grade level stories than were recalled from fifth grade level stories, and children recalled more following the instructions to underline than in the no instruction condition.

The significant Sex x Story interaction, $F(1,28) = 5.34$, $p < .05$, indicated that males recalled more than females on the third grade level stories. The Group x Sex x Condition interaction $F(1,28) = 15.71$, $p < .01$, indicates that the good reader females and the poor reader males exhibited the most improvement in the treatment condition. Despite these interactions, good readers generally recalled more information than poor readers and recall was significantly higher in the underlining condition.

Discussion

Poor readers detected anomalous information in stories less often than good readers in this study. This was evident in their spontaneous behavior while reading and when directed to underline incomprehensible information. Poor readers were also less able to answer the questions about each story correctly and to recall the information from memory. The deficits in comprehension monitoring observed in this study and others (Clay, 1973; Isakson & Miller, 1976) by poor readers are clearly correlated with poor story understanding. The instruction to underline anomalous information facilitated identification of this information and also promoted comprehension and recall. However, the brief manipulation did not eliminate the differences between good and poor readers and the gains could be due to practice effects. The primary importance of this study is the demonstration of poor comprehension monitoring skills by poor readers and its relation to poor comprehension and recall.

It is clear that young children and poor readers fail to monitor comprehension while reading, remembering, and listening (Ryan, 1979) but the reasons remain unspecified. Part of the answer seems to be that they are unaware of the value of monitoring and specific means for understanding (Flavell, 1978). Children have a lack of metacognitive knowledge about the purpose of the task and strategies for solving it. In an earlier study, we observed that eight year olds do not understand the variables that influence reading as well as twelve year olds and they have little knowledge about strategies for achieving or resolving comprehension (Myers & Paris, 1978). The failure of young and poor readers to understand the special strategies required for reading has been noted by others (Gibson, 1974; Golinkoff, 1976) and has implications for teaching. The production deficiency for comprehension strategies may be eliminated in part by explicit instruction regarding strategies. Such instruction must emphasize the child's awareness of the goal of meaning construction during reading and the functional value of specific means for achieving comprehension. Further research is needed to

Table 10

Mean Percent of Clauses Recalled

	Condition			
	Spontaneous Monitoring		Directed Underlining	
	Third	Fifth	Third	Fifth
Poor Readers	38.8	17.3	48.8	18.6
Good Readers	58.4	30.8	61.3	34.1

specify how good and poor readers differ in their metacognitive understanding of reading skills and how training can promote the utilization of monitoring strategies.

Chapter 4

Inferential Distance and Children's Memory for Pictorial Sequences

The development of inferential and integrative processes in memory has been the focus of a considerable amount of recent research (see Paris, 1975; 1978). Two different approaches have been followed in this research. Some investigators have studied inferential and integrative processes within the framework of the development of logical reasoning skills (Trabasso, 1977). Others have considered these processes in the context of comprehension of narrative sequences presented either verbally (Paris & Upton, 1976) or pictorially (Brown, 1976). In the present study, the latter approach was adopted, and children's abilities to remember, infer, and integrate the components of pictorial sequences of events were examined.

Narrative sequences can be loosely defined as chains of events that are connected by temporal, causal, or probabilistic relationships. Within the framework of the narrative sequence, inference has been operationally defined as the ability to produce or select events that are consistent with previously presented pictures or sentences (e.g., Schmidt & Paris, 1978). Narrative inferences are qualitatively different from the logical inferences investigated by Trabasso (1977) and others. Whereas logical inferences involve generation of relationships that are logically necessary given the premise information, narrative inferences require generation of events that are highly probable given the events presented in the narrative sequence. Semantic integration in memory for narrative sequences has been inferred from an inability to discriminate new-but-consistent sequence components from actually presented events (Brown, 1976). Researchers examining logical inferences have adopted a similar definition of semantic integration (Paris & Carter, 1973). The present study was designed to identify developmental trends in inferential and integrative processes and to determine whether these processes are influenced by a distance dimension of narrative inferences.

Assessments of inferential processing have been hampered by the lack of a theoretical framework for categorizing types of inferences according to various dimensions. Researchers have found some differential performance with various kinds of inferences (e.g., pragmatic vs. logical or lexical vs. contextual) but task demands, stimulus modality, complexity of inferences, etc. have often confounded a comparison of inference types. We wanted to investigate a general characteristic of inferences that would be independent of many of these unresolved or methodologically confounded issues and, therefore, chose to investigate the effects of inferential distance on children's thinking. Distance was operationally defined as the number of equal temporal steps intervening between an old narrative picture sequence and a new inference picture. The procedure for determining inferential distance is analogous to counting the intervening frames between events in a filmed sequence. As the temporal distance between two sequence components increases, the similarity between the components as well as the probability that one component will follow the other decrease. The hypothesis to be tested was that as the inferential distance between

presented sequences and implied pictures increased, the likelihood of judging the new components as consistent with or identical to original pictures would decrease. Further, the distance effect was expected to be more pronounced for young children who are more constrained in their ability to draw inferences (Brown & French, 1976; Schmidt & Paris, 1978).

A second purpose of this study was to determine if developmental improvement in inferential processing is due to (a) improvement in specialized reasoning skills or (b) increases in memory capacity with age. In support of the latter explanation, inferential ability and memory for premise information are highly correlated in young children (Trabasso, 1977). However, there is some evidence that suggests that inferential reasoning requires more than simple memory capacity. Paris and Upton (1976) partialled out a memory factor in an analysis of covariance and still found developmental improvement in inferential processing. Also, Paris, Lindauer, and Cox (1977) found that seven year olds often could recall a sentence when given a cue word taken from the sentence but the same children could not recall the same sentence when given an implicit retrieval cue. However, implicit and explicit retrieval cues were equally effective in promoting recall in adults. Thus, children's failure to use implicit cues effectively was not due to a simple failure to recall the sentence meaning.

The present study was designed to assess more directly developmental differences in the ability to make narrative inferences by conditionalizing inferential processing on children's memory for actually presented pictures. This procedure adjusts children's performance to equate initial memory for the sequences across age groups. The probability of making narrative inferences given accurate memory for presented components would be higher for older children than for younger children if inferential processing involves factors other than or in addition to memory capacity differences.

A third purpose of the study was to identify developmental trends in the semantic integration of sequence components in memory. After being asked to judge the consistency of old and new events with presented narrative sequences, children were asked whether the events were identical to events actually presented in the sequences. The identity judgments were included to determine whether children automatically integrate inferred relationships and therefore cannot discriminate between plausible inferences and presented information. If children integrate inferred relationships automatically, they should judge novel inferences as both consistent with and identical to presented sequence components. We were particularly interested in whether there would be developmental differences in the accuracy of identity judgments. If integration is seen as a process that improves memory efficiency, one might expect older children to be less accuarate in their identity judgments (i.e., to "integrate" more) than younger children. The developmental trends in such integration have not been clearly identified (Brown, 1976; Paris, 1975).

In summary, the purpose of the study was to investigate developmental changes in integrative and inferential processing of narrative sequences. The following questions were examined:

1. Do inferential skills improve with age when memory for premise information is held constant across age groups?
2. Do children integrate pictorial sequences and inferences in memory automatically and what conclusions can be drawn regarding the development of integrative processes?
3. Does inferential distance affect the likelihood of judging inferences as consistent with or identical to premise sequences and is the effect of distance more pronounced for young children?

Method

Subjects

Twenty kindergarteners (mean age = 5-8, range = 5-2 to 6-4), 20 first graders (mean age = 7-1, range 6-6 to 7-5), and 20 second graders (mean age = 7-9, range 7-3 to 8-9) from two local elementary schools participated in the study. There were equal numbers of males and females at each grade level.

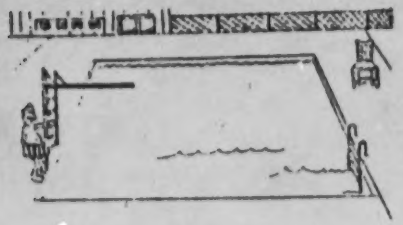
Materials

The stimuli were five sets of 10 pictures. Each set contained a six-picture story sequence and four distractor pictures. Each picture was a colored cartoon sketched on a 12.7 x 20.3 cm index card. An example of one of the stimulus sets appears in Figure 1. The remaining four stimulus sets were centered around the following themes: 1) two children sledding, 2) a pilot bailing out of a burning airplane, 3) a man chopping down a tree, and 4) a horseback rider jumping over fences. The individual items in each story sequence were designed to represent discrete components of a chain of events that could take place during a relatively brief interval (a few minutes at most). The individual pictures resemble "stills" taken at equal temporal intervals from a filmed sequence. The relationship between the first three pictures of the sequence and the last three was such that the latter could be easily inferred from a knowledge of the former. The distractor pictures for each stimulus set contained the same settings, objects, and characters as the sequential pictures for the set, but involved transformations of the positions of the major characters. Distractors were constructed so that they did not fit easily into the immediate chain of events portrayed by the sequential pictures.

Procedure

Each subject was tested individually. The experiment consisted of an acquisition and a test phase. The acquisition phase was presented as a story telling game. A female experimenter told the children that she would show them a series of pictorial "stories". Subjects were instructed to look at each of the pictures and to try to understand and remember the stories because later they would be asked questions about the stories. The experimenter then presented the first three pictures of each story simultaneously and in the correct sequential order. Each sequence was presented for 20 sec with 15 sec intervals separating each sequence presentation. After viewing all five stories, subjects engaged in a three min interpolated

Story Sequence



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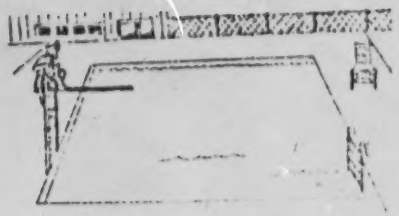

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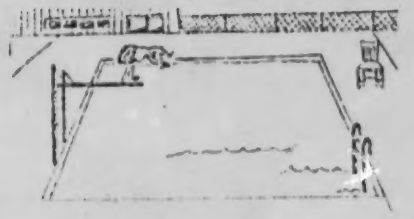

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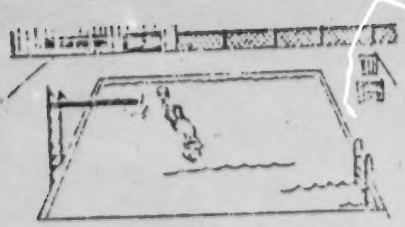

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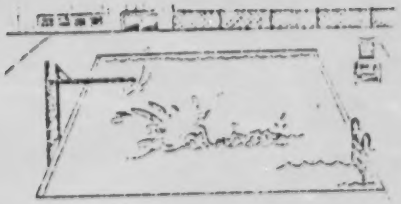

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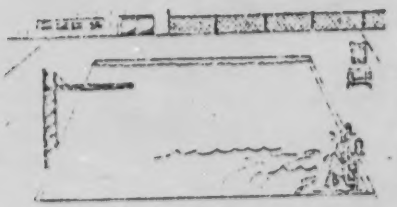

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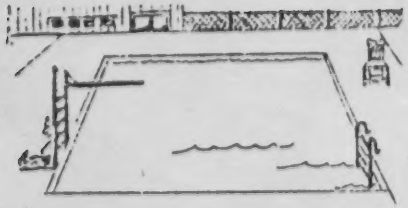
Distractors



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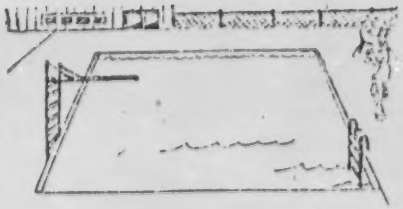

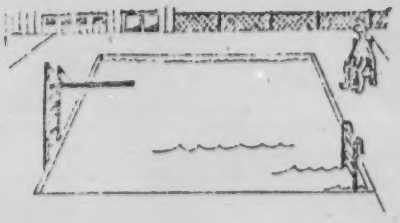

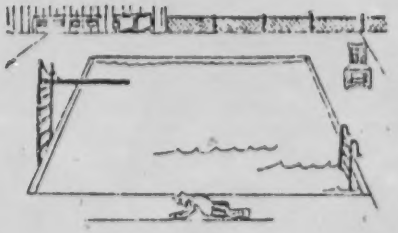

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Figure 1

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activity. The order of presentation of the five story sequences was balanced so that each story was in each serial position for four subjects in each grade. Subjects were randomly assigned to presentation orders with the constraint that two males and two females in each grade received each presentation order.

The test phase of the experiment consisted of 20 two-alternative selection trials. Each two-alternative test array contained a story picture and a distractor picture from the same stimulus set. Each of the five stimulus sets was used to form two memory and two inference trials. Four pictures from each six-picture sequence were tested: pictures 1, 3, 4, and 6. On memory trials, pictures 1 and 3 (old pictures that had been presented during acquisition) were tested. On inference trials, pictures 4 and 6 (new pictures that were consistent with presented sequences) were tested. The four distractors for each story were randomly paired with pictures 1, 3, 4, and 6 for each subject. The right-left positions of the story pictures in the two-alternative arrays were randomized on each trial. There was also a different random ordering of the 20 test trials for each subject with the constraint that trials from the same stimulus set were not adjacent. These 20 different test orders were the same for each grade.

Two different types of judgments were required on each test trial, consistency and identity. At the beginning of the test phase, the child received general instructions that dealt only with consistency judgments. Children were told that the correct choice on each two-alternative trial would either be a picture that they had seen previously or a new picture that "fit into" one of the original stories. During each test trial, the experimenter repeated the consistency instructions in the following abbreviated form: "Which one of these pictures goes with one of the stories I showed you? Which picture makes the most sense with the story?" The consistency judgments were forced-choice; subjects were required to point to one of the two alternatives.

After the subject responded to each consistency question, an identity judgment was required. The experimenter asked the child, "Did you see either of these pictures before or are they both brand new?" If the child did not appear to comprehend the question, it was reworded, "Was one of these pictures actually in one of the stories I showed you?" The identity judgments were not forced-choice. On inference test trials both of the alternatives were new pictures so the child could correctly respond that neither of the pictures had been presented during acquisition.

Design

A 3 (Grade) x 5 (Presentation Order) x 2 (Sex) x 2 (Type of Trial: Memory or Inference) x 4 (Sequence Component: Pictures 1, 3, 4, and 6) factorial design was employed. Type of trial and sequence component tested were within subjects factors and sequence component was nested under type of trial.

Results

The results for the consistency and identity judgments will be presented

separately.

Consistency judgments

The mean numbers of correct picture selections on the two-alternative forced-choice (2AFC) task are presented in Table 11 according to grade, type of trial, and sequence component. The mean correct selections increased with age and varied according to the type of trial and the sequence component tested. The overall means for the kindergarteners, first graders, and second graders were 14.6, 17.8, and 18.6, respectively. A Grade x Presentation Order x Sex x Type of Trial x Sequence Component ANOVA was performed on the data. Significant main effects of grade, $F(2,30) = 11.46$, $p < .01$, type of trial, $F(1,30) = 20.52$, $p < .01$, and sequence component, $F(2,60) = 7.20$, $p < .01$, were obtained.

A Newman-Keuls analysis of grade means revealed that while kindergarteners' performance was significantly lower than first or second graders' performance, $ps < .01$, the two older grades did not differ significantly. Newman-Keuls tests on sequence component means showed that while performance was equivalent on pictures 1, 3, and 4, performance on picture 6 was significantly lower ($ps < .01$) than performance on any of the three other pictures. Thus, performance on "near" inferences (picture 4) was as high as performance on memory items, while performance on "distant" inferences (picture 6) was lower. The superiority in performance on picture 4 was confirmed by an analysis of individual subjects. Across all grades, half of the subjects performed better on picture 4 than on picture 6, 35% performed equally well on both pictures, and only 15% performed better on picture 6 than on picture 4.

The predicted grade x sequence component interaction was not obtained. However, as Table 1 indicates, the magnitude of the performance difference between pictures 4 and 6 did decline with age. Also, an analysis of individual subjects revealed a decline with age in the percentage of subjects performing better on picture 4 than on picture 6 from 60% of the kindergarteners to 50% of the first graders and 40% of the second graders. Perhaps if a wider age range had been tested and the temporal "distance" between pictures 4 and 6 had been greater, the interaction between grade and sequence component would have reached significance.

The observed main effect of type of trial reflected superior performance on memory trials relative to inference trials. A significant interaction between grade and type of trial was also observed, $F(2,30) = 4.73$, $p < .05$. An analysis of simple effects revealed that second graders performed equally well on memory and inference trials while younger children were correct more often on memory items. Given that second graders were correct on over 90% of their consistency judgments, it may be that ceiling effects account for the lack of difference between memory and inference trials in the second grade sample.

In order to determine if inferential ability improved with age above and beyond developmental increases in memory capacity, performance on inference trials was conditionalized on performance on memory trials for the consistency judgments. The mean probabilities that pictures 4 or 6

Table 11

Mean Numbers of Trials Correct for Each Sequence Component at Each Grade Level for the Consistency Judgments

	Type of Trial					
	Memory			Inference		
Grade	Picture 1	Picture 3	Total Memory	Picture 4	Picture 6	Total Inference
K	3.9	3.9	3.9	3.9	3.0	3.4
1	4.8	4.8	4.8	4.3	3.9	4.1
2	4.6	4.8	4.7	4.8	4.5	4.6

Note: The maximum value in each cell is 5.

were correctly selected for a particular sequence given that both pictures 1 and 3 were correctly chosen for that same sequence are presented in Table 12 according to grade level. The mean probabilities were .68, .82, and .92 for the kindergarteners, first graders, and second graders, respectively. To stabilize the variances, arcsin transformations of the conditional probabilities were calculated following the procedure recommended by Winer (1971, pp. 399-400). A Grade x Presentation Order x Sex x Sequence Component (picture 4 vs. picture 6) ANOVA was conducted on the arcsin transformations. The only significant effects obtained were the main effects of grade, $F(2,30) = 9.77$, $p < .01$, and sequence component, $F(2,30) = 7.77$, $p < .01$. A Newman-Keuls analysis on the grade means indicated that all three grades differed significantly in the probability of making an inference given that they remembered the old items in the sequence ($ps < .01$). Thus, even when memory for old items is held constant across age groups, there is developmental improvement in inferential ability. The main effect of sequence component reflects the superiority in performance on picture 4 relative to performance on picture 6. Again, analysis of individual subjects confirmed the observed superiority in performance on picture 4. Across all grade levels, 40% of the subjects performed better on picture 4 than on picture 6, 47% performed equally well on both pictures, and only 13% performed better on picture 6 than on picture 4. Also, the magnitude of the performance difference between pictures 4 and 6 decreased with age. However, the grade x sequence component interaction was not significant.

Two separate ANOVAs were conducted to determine the reliability of the grade and sequence component effects by conditionalizing selection of pictures 4 and 6 first on memory for picture 1 and then on memory for picture 3. Again, arcsin transformations of the conditional probabilities were performed. The results of these analyses confirmed the results obtained by conditionalizing on memory for both pictures 1 and 3. The three ANOVAs were also repeated using untransformed conditional probabilities and the same results were obtained.

The results of all the analyses of the consistency judgments data provide convincing evidence that inferential ability improves from five to nine years of age. Further, the analyses of conditional probabilities suggest that developmental improvements in inferential ability cannot be attributed solely to age-related increases in memory capacity. Even when memory for old items is accurate, older children perform better on both near and far inferences than younger children. The consistency judgments also indicate that the temporal distance between a presented sequence and possible consequences of the sequence affects the accuracy of inferential judgments. Consequences that immediately follow the sequence are more readily inferred than more temporally distant consequences. A series of analyses was conducted on the identity judgments data to determine whether the distance parameter affects the discrimination of new and old information in memory.

Identity judgments

On each trial the subject could respond that the story picture, the

Table 12

Probabilities of Correctly Choosing Picture 4 or Picture 6 Given that Pictures 1 and 3 Were Correctly Chosen for the Consistency Judgments

	Sequence Component	
Grade	Picture 4	Picture 6
K	.78	.58
1	.87	.78
2	.94	.91

Note: The maximum value in each cell is 1.00.

distractor, or neither picture was "exactly like" a picture presented during the acquisition phase of the experiment. The mean numbers of story pictures and distractors selected as being identical to pictures presented during the acquisition phase are presented in Table 13 according to grade level.

A Grade x Presentation Order x Sex x Type of Trial x Sequence Component ANOVA was conducted on the story picture selection data. Significant main effects of sequence component, $F(2,60) = 8.33$, $p < .01$, and type of trial, $F(1,30) = 3.3193$, $p < .01$, were obtained as was a significant intereaction between grade and type of trial, $F(2,30) = 9.84$, $p < .01$. A Newman-Keuls analysis of the sequence component means revealed that while children were equally likely to identify pictures 1 and 3 as old pictures, they were less likely to identify picture 4 than pictures 1 and 3, and less likely to identify picture 6 than picture 4 (ps < .01). Thus, the likelihood of integrating or confusing new information with original sequence pictures decreased as the distance of the inferences increased. This effect of distance was confirmed in an analysis of the data from individual subjects. Across grade levels, 50% of the children selected picture 4 as a previously seem item more often than picture 6, 43% selected both pictures equally often, and only 7% selected picture 6 more often than picture 4.

The amin effect of type of trial reflected higher levels of correct identification on memory trials than on inference trials. An analysis of simple effects was conducted to clarify the grade x type of trial interaction. The main effect of type of trial was significant for all three grade levels; $F(1,30) = 44.56$, $p < .01$, for kindergarteners, $F(1,30) = 130.05$, $p < .01$, for the first graders, and $F(1,30) = 158.85$, $p < .01$, for the second graders. Further, the main effect of grade was significant on memory trials, $F(1,30) = 19.19$, $p < .01$, and marginally significant on inference trials, $F(1,30) = 4.11$, $p < .06$. The main effect of grade for memory trials reflects the increasing probability with age of correctly identifying old pictures as exactly like acquisition pcitures. The grade effect for inference trials reflects the decreasing probability with age of incorrectly selecting inference pictures as previously seen items.

A separate analysis of the identity judgments data was conducted by conditionalizing identity judgments on currect consistency judgments. The probability of saying a story picture was exactly like a picture presented during acquisition given that the same story picture was correctly selected for the consistency judgment was calculated for each subject for each sequence component. The conditionalization procedure eliminated the ten instances in which subjects displayed "random" picture selection by selecting a distractor picture for the consistency judgment and a story picture for the identity judgment.

A Grade x Presentation Order x Sex x Type of Trial x Sequence Component ANOVA was conducted on the arcsin transformations of the conditional probabilities. The results of this analysis confirmed the results reported above for the original analysis of the identity judgments data. The only difference of interest between the two analyses was that the simple main effect of grade for inference judgments that was marginally significant in the original analysis, reached significance in the

Table 13

Mean Number of Trials on Which the Subject Identified Pictures as Previously Seen Items for Sequence Components and Distractors at Each Grade Level

	Type of Trial						
	Memory			Inference			
Grade	Picture 1	Picture 3	Total Memory	Picture 4	Picture 6	Total Inference	Distractors
K	2.8	2.9	2.8	1.4	0.7	1.0	0.4
1	3.9	4.3	4.1	1.4	0.6	1.0	0.3
2	3.9	3.9	3.9	0.7	0.3	0.5	0.3

Note: The maximum value in each cell is five. The mean number of distractors out of a possible 20 has been divided by four to simplify mean comparisons.

conditional probabilities analysis, $F(1,30) = 10.07$, $p < .01$.

Discussion

In this study it was possible to disentangle developmental improvements in memory for premise information and improvements in inferential processing by conditionalizing inferential judgments on memory for original sequences. The results of these analyses indicated that the probability of correctly judging the compatibility of new sequential information with presented information given accurate memory of presented sequences increased significantly across the age levels tested. Clearly, the inferential construction of new temporal relationships based on action sequences represents a cognitive ability that develops above and beyond improved retention of original sequences. Converging evidence for developmental improvements in inferential processing, independent of increases in memory capacity, was obtained with older children (second through eighth grade) in a study by Collins, Wellman, Keniston, and Westby (in press). These researchers found developmental improvement in the inferences drawn by children viewing televised social interactions when memory for premise information was held constant.

Developmental changes in inferential ability were observed in this study at somewhat younger ages than in studies using verbal stimuli or prose passages. However, the observed developmental trends are consistent with the results of other studies using pictorial, narrative sequences (Brown, 1976; Schmidt & Paris, 1978). There are at least three reasons for the age differences. First, comprehension and memory for the presented information could be more difficult with verbal stimuli. Secord, inferences such as presupposition, semantic entailment, and affective inferences could be more difficult than the causal and temporal inferences required in narrative, temporal sequencing. Third, inferential processing could be a general ability that is applied to different task domains at different ages. Task difficulty, inferential complexity, stimulus modality, and other variables could affect the ease and likelihood of drawing inferences. The ability to construct new relationships from old information may be a basic human capacity that is not "acquired" at a particular age but is manifested in a functional manner in different tasks at different ages. The deliberate use of inferential thinking as an operation to aid comprehension and memory may develop rapidly during middle childhood (ages 6 to 12) as do many other mnemonic and study skills.

The results of the current study also have implications for research on the development of integrative processes. Integration, defined as incorrect identification of inferences as previously seen items, was relatively infrequent in this experiment. Overall, children judged that only 17% of the new inference pictures were exactly like pictures they had seen at acquisition. These same inferences were judged as consistent with presented sequences 81% of the time. The high levels of accuracy may preclude wholistic integration as conventionally measured. However, these results do not necessarily indicate that children do not integrate related events when memory for pictorial sequences is required. Brown (1976) has found much higher rates of false alarms to true inferences in

a pictorial reconstruction task. However, Brown tested integration of middle sequence components while in the current study, sequence endpoints (consequences) were tested. Perhaps the tendency to integrate information into wholistic schemes in which memory for exact stimuli is lost is more pronounced for middle sequence components (or more poorly remembered components) than for sequence endpoints.

Despite the fact that overall levels of integration were low, the false alarm rates decreased as the age of the subjects and the accuracy of memory for old stimuli increased. Does this mean that older children and better memorizers integrate information less frequently than younger children? The answer to this question is yes if integration is defined (as it was in this study and has been in many previous investigations) as a failure to discriminate new information from old in memory. When a lack of discriminability is regarded as evidence for integrative processing, developmental trends in integration will be confounded with developmental improvements in memory for old information. It is apparent that recognition accuracy and recognition inaccuracy for the same information are reciprocal and cannot develop in synchrony. False alarm rates in recognition tasks were satisfactory for initial attempts to demonstrate confusion or wholistic synthesis in children's memory for pictures and sentences (Paris, 1975), but they have been used inappropriately for analyzing developmental changes in integration. New measures of integration in memory are clearly needed.

Perhaps the difficulty of arriving at developmentally sensitive measures of integration may be partially alleviated by defining integration generically as a constructive and transformational skill. When integration is viewed "positively" as the organization and unitization of pieces of information into related wholes, its relationship to memory efficiency and development is apparent. A positive view of integration would emphasize that although retention of some characteristics of the exact stimuli may be lost, comprehension and retrieval can be enhanced by the elaboration of new and unifying relations among pictures or sentences.

A third major finding of this study involves the effect of "distance" on inferential and integrative processing of pictorial sequences. If inferences involve "going beyond the given information," then distance is an underlying dimension of inferential processing. This parameter has not been empirically investigated before. In the present study, children were more likely to judge pictures that were temporally and probabilistically "close" to original sequences as both consistent with and identical to previously observed sequences than pictures that were more temporally removed from old sequences. The observed distance effect suggests that although children between the ages of five and nine do go beyond given information, their inferential and integrative processing are relatively shallow and do not extend to the elaboration of "far" inferences. At least three reasons for limited processing are possible. First, young children may not comprehend thoroughly initial sequences or may remember only single pictures and not relations among pictures. Second, young children may interpret the task as rote recall of only the presented information and therefore not attempt to elaborate upon the stimuli. Third,

young children may fail to produce far inferences spontaneously although they could do so readily with instruction (i.e., a temporary production deficiency rather than an enduring processing inability). Each of these speculations, limited comprehension, lack of purposeful elaboration, and lack of spontaneous inferences, would yield predictions consistent with the observed distance effects.

There was some indication that the magnitude of the distance effect may not be constant across age levels. In the analyses of the consistency judgments, the superiority in performance on near over far inferences was more pronounced for younger children, although the age by distance interaction did not reach significance. Perhaps the interaction would have been more reliable if the temporal and causal distance between pictures 4 and 6 had been greater and a wider age range had been employed. Clearly, distance as a dimension can be manipulated in many ways and will not always lead to the same effect. The findings suggest that researchers interested in children's abilities to remember and operate on pictorial sequences should be wary of their stimulus materials. The distance and difficulty of the implicit relationships in sequences can affect inferential processing and this effect may be more pronounced for younger children. In conclusion, the current study has revealed that developmental improvements in inferential processing cannot be attributed solely to increases with age in memory capacity. Further, distance has been identified as an important parameter of narrative inferences that can affect children's spontaneous abilities to draw inferences and synthesize relationships.

Chapter 5

Comprehension Strategies and Repeated Recall with Good and Poor Readers

Poor readers are not a homogeneous group. They exhibit a wide variety of perceptual and cognitive shortcomings, some are specific to reading tasks and others are quite general limitations in problem-solving skills. The latter group of general limitations has engendered a great deal of interest because these skills seem partly responsible for the poor comprehension and memory of school age children with reading problems. Golinkoff (1976) and Smith (1975) have concluded that poor readers concentrate their attention on phoneme-grapheme correspondence and decode print in order to pronounce words correctly. Reviewing, elaborating, and constructing meaning from sentences and paragraphs do not appear to be goals of poor readers, Ryan (1978) has concluded that poor readers are characterized generally by their failure to implement strategies to insure and check comprehension.

Our research has focussed on these general comprehension skills also. Our previous studies have indicated that beginning and poor readers (a) do not use comprehension strategies often and (b) do not seem to be aware of variables that affect reading. Our hypothesis is that poor readers do not adopt appropriate comprehension goals while reading and therefore do not understand the value of meaning-construction strategies for achieving reading proficiency. The failure to select and coordinate means and goals for comprehension is a pervasive problem in cognitive development and may be a general symptom of children with reading problems.

The purpose of the present study was to assess children's understanding of comprehension strategies to determine their awareness of positive and negative influences on reading comprehension. We also measured children's study behavior to assess comprehension monitoring and children's short and long term retention of stories. In this way, children's knowledge about comprehension skills could be related directly to their performance. We expected poor readers to manifest fewer comprehension strategies, to have a poorer understanding of variables that affect reading, and to recall stories in a less organized fashion. Since the data from this study are not completely analyzed at this time, the results are reported tentatively and without statistical tests.

Method

Subjects

The subjects were twenty-eight fourth graders from the Ann Arbor school district. Two groups of 14 good and poor readers, with equal sex representation, were formed on the basis of test scores derived from the California Achievement Test (CAT). The good and poor reading groups were defined according to deviations from local norms on the CAT, roughly the top and bottom quartiles.

Materials

Story materials. The stimulus passage was constructed by combining two fourth grade level stories selected from the Spache (1972) Diagnostic Reading Scales. Story cohesiveness was attained by including two introductory sentences and a four sentence concluding paragraph. The story was further modified by replacing three nouns and one verb with synonyms that were judged to be above the average fourth graders' reading vocabulary (e.g., antler, papaya, meandered, menagerie). The resulting passage consisted of twenty sentences that could easily yield to a story grammar analysis and included advanced vocabulary words that were scattered throughout the passage in contexually appropriate positions.

Strategies. Twenty strategies that could influence memory for stories were generated and grouped into four equal categories. The grouping consisted of ten positive strategies that could facilitate comprehension and remembering and ten negative strategies that could be detrimental. The positive and negative groups were further divided into internal "in the head" strategies (e.g., positive: "ask yourself questions about the ideas in the story", negative: "think about something else while reading") and into external strategies requiring additional materials or other people (e.g., positive: "look up words you don't know in the dictionary", negative: "watch TV while you read"). Five neutral questions reflecting information irrelevant to memory and comprehension were also included (e.g., "does it help to remember the story if it's typed in blue instead of black ink").

Rating Scale. A visual aid was constructed in order to facilitate children's strategy evaluations and ratings. A graph resembling a histogram was drawn on a 8 1/2 x 11 sheet of paper. A .75 x .50 inch box with "No differences" written in it was drawn in the center of the page. A horizontal axis was drawn from the midpoint of the .5 in sides. To the right, four boxes successively increasing in height by .75 inches were drawn above the axis and, to the left, four boxes inversely repeating the right side sequence were drawn below the axis. The first and last boxes to the right of the neutral box were respectively labeled "helps a little" and "helps a lot" while the first and last boxes to the left were labelled "hurts a little" and "hurts a lot."

Procedure

The tasks were administered to individual children in a quiet room in the school. The initial and follow-up sessions were informal and lasted approximately 25 minutes and 10 minutes respectively and were described to the children as reading and memory games. A dictionary, pencil and blank sheet of paper were positioned in front of each child. Before being presented with the story, children were instructed to read and study the story so they could remember it later. They could study in any way that they liked. The experimenter suggested that they could use the pencil to write on the blank paper or on the story sheet, use the dictionary, or ask questions. Children were then presented the stimulus sheet, told to write their name on it, and instructed to signal the experimenter when they knew the story well enough to remember it. During the study period, the experimenter recorded study time and the number and type of observed strategies. Following the study period, children were

asked to report on their activities during the study period and were asked to define the four advanced vocabulary words. Free recall and reported activities and definitions were tape recorded.

The second phase of the initial session involved children's ratings of the utility of reading strategies. A nine point graphic rating scale indicating the degree to which a strategy would facilitate or hinder memory was described to the children. Subjects were verbally presented with twenty-five strategies in random order and asked to point to the location on the rating scale that best reflected the utility of that strategy. The experimenter numerically coded and recorded each rating response.

The follow-up session succeeded the initial session by seven days. Children were informed that they were to recall the story presented the previous week, and given a cue that the story was about "field trips". The verbal recall was tape recorded.

Results

Study behavior. Less than half of the children engaged in overt study behavior although many reported that they reread and concentrated on the story. Four poor readers and two good readers asked the experimenter to pronounce words for them while six good readers and no poor readers asked questions about the meaning of words and phrases or look them up in the dictionary. Only four poor readers took any kinds of notes while 11 good readers copied words or wrote summaries of the story. There were clear differences in the frequency with which good and poor readers tried to monitor the meaning of the story while studying.

Strategy rankings. Both groups of children rated the neutral items similarly and no response bias difference was observed. Although poor readers rated positive influences on reading in the same manner as good readers, they did not rate the negative influences as debilitating as good readers. (See Table 14). Indeed, there were twice as many negative influences rated as positive by the poor readers. Poor readers seemed particularly insensitve to the negative influences of external factors such as watching TV while reading. They regarded a strategy of covering up all words with your hand except the one being read as positive. Poor readers also thought saying each word over and over helped comprehension. While these strategies are regarded as negative influences by good readers and adults on comprehension, they are clearly in line with a word for word decoding goal of poor readers.

Recall. Good readers recalled more story grammar units (e.g., settings, initiating events, etc.) than poor readers on both first and second recall sessions. See Table 15. We also calculated the recall of integrated episodes and found that poor readers were much worse in their recall of cohesive information. They integrated intersentential information infrequently compared to good readers. The patterns of recall were similar for both groups over time and there was little evidence of greater deterioration in recall for poor readers.

Table 14

Strategy Ratings

	Positive		Negative	
	Internal	External	Internal	External
Poor Readers	8.1	7.2	3.5	4.8
Good Readers	7.3	7.2	2.5	3.9

Note. The scale ranged from 1 to 9 with higher numbers reflecting a positive evaluation.

Table 15

Percent Units and Episodes Recalled

	First Recall		Second Recall	
	Grammatical Units	Episodes	Grammatical Units	Episodes
Poor Readers	41	36	32	24
Good Readers	52	60	46	50

Discussion

Although the data are not completely analyzed, the results suggest that poor readers adopt decoding goals during reading. They do not employ many comprehension monitoring strategies and do not view negative influences on comprehension the same way as good readers. Their recall and integration of story information suffers from their decoding goals and strategies. An intervention program aimed at realigning the goals and strategies of poor readers may change their metacognitive understanding of reading strategies and increase their comprehension.

Conclusions

These studies have demonstrated several differences in constructive comprehension skills. Using both age and reading ability as developmental indices, it was shown that young children and poor readers seldom employ cognitive strategies to enhance comprehension and seem unaware of many parameters that influence comprehension and memory. Like the data on the development of metamemory, young children are unaware of many Person, Task, and Strategy variables that influence reading. Poor readers appear to have little awareness of specific strategies for enhancing comprehension and, as shown in studies 3 and 5, they rarely monitor the meaning of the information they read and study. The lower levels of comprehension and memory (and poorer memory integration) observed in poor readers appears to be highly correlated with inadequate strategy understanding and use. Further research is needed to establish the causal connection between performance and children's metacognitive knowledge about reading but our studies suggest that there may be a connection.

Although we do not feel that our data should be overgeneralized, some cautious and tentative speculations about teaching prescriptions may be made. Poor readers appear to regard reading as a decoding process. Their goals and strategies fit this purpose and they do not utilize higher order comprehension strategies. Teachers could directly train poor readers to adopt comprehension goals and they could make children aware of reading variables and strategies. Specific strategies such as inferencing, oral self-correction, underlining, note-taking, and rereading could be taught as means to achieve comprehension goals. Perhaps the most important point, though, is that awareness is not enough. Children must be taught the value of comprehension strategeis as goal oriented activities so that they can invoke them deliberately on their own initiative. Teaching poor readers means, goals, and the coordination of them as functional reading skills may be a crucial step in remediation.

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General Summary

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The Development of Constructive Comprehension Skills

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CS004 885

Introduction

In order to solve a complex cognitive task, one needs to know the strategies that can be employed. Further, one needs to know something about the structure of the task and its various parameters. Adults usually have rich knowledge about these variables that they bring to bear on a task. However, children are problem-solving novices in many ways and may have only a vague appreciation of their cognitive skills and the relationship between these skills and successful task solutions. Part of the educational process involves teaching cognitive strategies to children yet, oftentimes, children must induce rules and construct strategies. This research project was part of my continued investigation into children's constructive comprehension skills.

The particular cognitive tasks of interest in this research have been reading and listening because they are so important for children's education. We have tried to assess how children understand the demands of tasks like reading and how they use strategies to insure good comprehension and memory. Let me be more explicit. The kinds of constructive strategies that we are investigating include; the ability to make inferences from stories that children read or hear, the ability to organize the meaning of stories into cohesive units, the ability to detect incomprehensible information, and the ability to monitor and correct the meaning of stories. Each of these abilities is constructive because each requires the child to generate meaningful information during reading or listening through active learning strategies.

The purpose of the research was to assess developmental differences in children; use of constructive strategies. In some of the studies we used age as a developmental index while in others we compared children of the same ages who differred in reading ability. The point to such descriptive research is to specify the precise strategy weaknesses of young and poor readers. If we can identify crucial strategies for comprehension and memory and describe developmental differences in the use of such skills, then we can offer detailed suggestions for improving classroom curricula

and teaching techniques in order to promote the acquisition of better problem-solving skills. The five studies included in this grant will be summarized separately for convenience but the rationale is common to all of them.

Metacognitive Knowledge about Reading

In our previous studies of children's inferential comprehension and memory, we found that young children (less than 8 years old) often approached memory tasks as rote recall tasks. They integrated, organized, and inferred information only occasionally while older children seemed to apply these constructive transformations more spontaneously. We were struck by the similar performance of young children in reading and memory tasks in this regard. For example, beginning (or poor) readers often decode and pronounce the words correctly, but they do not synthesize complex semantic relationships very often. Why? Flavell (1978) has suggested that young children are not sensitive to the need to apply strategies in memory tasks and that their poor understanding of task variables leads to a rote interpretation of the task.

We conducted an interview study to investigate what children know about reading as a complex task. Following Flavell and Wellman's (1977) research, we asked children questions about their personal abilities to read, questions about task parameters, and questions about reading strategies. In this study, subjects were second- and sixth-grade children of average reading ability. Briefly, we found that second-graders had little idea of the skills involved in proficient reading and did not know what they needed to learn to become a good reader. They also seemed unaware of many task variables. They didn't understand the structure of paragraphs or the information normally contained in introductory or summary sentences. They did understand how familiarity, interest, and length affected comprehension, though.

Perhaps the most interesting finding was that second graders were unaware of different reading strategies. They did not understand how rereading, imagery, or elaboration could facilitate comprehension. When we asked them what words they would read if they could only read some of the passage (i.e., skimming), they frequently reported the "little ones" or the "easy words". Young children reported that they would read word for word and would tell someone else the story verbatim. They did not appear sensitive to the extraction and construction of meaning as a purpose of reading nor were they able to understand different goals of reading. Young children also had few strategies for resolving comprehension failures and usually reported that they would skip words and sentences that they couldn't understand.

Some of these results are not surprising since second-graders may not have been taught special reading strategies nor had enough experience to induce them. Yet, their insensitivity to reading strategies is highly correlated with their failure to use constructive reading skills and it is not clear why these aspects of reading could not be taught directly. Further research is needed to demonstrate that awareness leads to improved reading but young children's unawareness of reading variables is a good hypothesis for their lack of strategy use at this point.

Monitoring, Organizing, and Recalling Stories

The purpose of this study was to replicate the interview data obtained in the previous experiment and to correlate children's awareness with reading skills. We expected that children's understanding of reading paramaters would be highly related to their study and recall abilities. There were three separate phases of this study. Initially, third and sixth grade children were administered an interview similar to the one described previously. In the second phase, children were asked to rearrange a scrambled story into an organized story

and to rate the importance of each sentence for each story. In the third phase, children read, studied, and recalled an organized story. Thus, we measured differences in children's awareness of reading parameters, ability to rearrange scrambled stories, ability to rank sentence importance, ability to recall, and ability to select parts of stories for study.

The results indicated many differences between third and sixth graders in awareness of reading variables and were generally consistent with the first study. However, there were few other differences between 9 and 12 year olds. The children in both grades constructed similar stories with the same levels of accuracy. Children (and adults) exhibited a great range of responses while rating the importance of individual sentences and the task was too difficult for children. While other studies have shown a developmental difference in this ability, the present task was too difficult or the children were too similar in age. Also no differences were found between groups of children in their ability to select sentences for study or in the number of sentences recalled. These results were disappointing and the study needs to be redone with easier materials and younger children. Despite the lack of age differences, a correlational analysis revealed that awareness of reading skills in the interview were highly related to accurate story recall and story reorganization. Children, regardless of age, who reported strategies for rereading and constructing semantic relationships in the interview produced the most accurate story recall. Thus, awareness of reading skills does seem to be correlated with comprehension and memory but not on all of our tasks.

Comprehension Monitoring in Good and Poor Readers

One of the strategies necessary for reading proficiency is the ability to detect incomprehensible information. Poor readers often concentrate on decoding the printed word and do not try to make sense of what they read. The failure to

monitor meaning actively can lead to poor comprehension and memory. Some evidence suggests that poor readers do not correct inaccuracies while reading orally nearly as often as good readers. The purpose of this study was to assess such differences in comprehension monitoring among good and poor readers.

We asked fourth grade children to read stories that contained some pronounceable nonsense words and mixed up phrases and we measured monitoring in two ways. First, we recorded self-corrections and hesitations during oral reading as an index of spontaneous monitoring. Second, we directed children to underline parts of the story that they did not understand. We also assessed comprehension and memory for the stories by asking children questions and obtaining free recall.

The results indicated that poor readers were significantly worse than good readers at noticing anomalous information. They spontaneously self-corrected or noticed the peculiar words and phrases rarely and, even when directed to underline them, were less able to notice semantic incongruities. The poor readers also recalled less of the stories and were more inaccurate in answering questions about the stories. Comprehension monitoring skills are clearly deficient in poor readers and are correlated with their poor understanding and memory. This points out the need for instruction on how to review and test the meaning of the information as children read.

Inferential Distance and Children's Memory for Picture Sequences

Our previous research has indicated that young children often do not add inferential relationships to pictures and stories and therefore have a shallower understanding and poorer memory than older children. In this study we were primarily interested in two questions: "Does inferential processing improve beyond general increases in memory span?" and "Do children make some inferences easier than others?"

We used a pictorial task in this study since we were testing 5 to 8 year olds who could not read complex stories. (We are pursuing this type of investigation with older children in a reading task however.) Children saw sequences of four pictures that resembled "stills" from a movie. Later they were given a modified recognition memory test to determine if they recalled the original sequence and if they could recognize probable (i.e., inferred) consequences to the sequences. Some of the consequences were highly related to the sequence while others were more removed, thus comprising near and far inferences.

The results indicated that children could often infer the near inference but only occasionally could they recognize a far inference as likely. Thus, young children's constructive and elaborative skills seem restricted to the here-and-now of the original events. We also found that children's inferential processing increased with age even when memory for the original sequences was controlled. Thus, inferences were generated as constructive comprehension strategies to a greater extent by older children. The results of this study suggest that story materials need to be generated to allow near inferences for young children and that special instructions need to be given about the use of inference as a strategy that enhances comprehension.

Comprehension Strategies and Repeated Recall with Good and Poor Readers

The results of our research suggest that poor readers do not use comprehension monitoring strategies in oral reading or directed underlining to the same extent as good readers. If this is true, then poor readers study skills may also be less focussed on meaning extraction. We investigated comprehension monitoring and studying in the present study. We also collected children's subjective ratings of different variables that affect studying and understanding

while reading. Finally, we are going to correlate these data with children's recall of the story. The data are not completely analyzed at this time but some results seem clear and they will be reported.

Good and poor readers from the fourth grade were presented a twenty sentence, structured passage to study and recall. The story included four difficult vocabulary words such as "menagerie" to determine when chilren would ask the experimenter for a definition, indicate a comprehension failure, or look it up in a provided dictionary. We also recorded overt study behavior such as underlining and note-taking. Only four poor readers asked the experimenter how to pronounce the difficult words and none inquired about the meaning. On the other hand, two good readers asked for help in pronounciation and six asked for a definition or looked up the word in a dictionary. Four of the poor readers and eleven good readers took notes or underlined as part of their study behavior. The incidence of monitoring the meaning of the story was clearly greater for the good readers.

Children's recall was obtained immediately and one week later. Poor readers recalled less than good readers on both occasions but the percentage of decline in the second recall was similar for both groups. However, poor readers recalled fewer integrated episodes from the story, tended to forget more episodes with time, and added superfluous information more often than good readers. Their study and recall behavior seemed to reflect a decoding approach to reading rather than meaning construction.

Finally, we asked children to rate reading variables on a nine point scale indicating whether each variable had a positive or negative influence on reading comprehension. For example, we asked, "Does it help you understand the story if:

a) you underline important parts

b) you watch TV while you read

c) you read the story backwards

d) you say the main ideas over and over?"

These variables were divided into categories of positive and negative influences as well as internal cognitive versus external sources. While good and poor readers were equally able to rate positive influences, many poor readers did not view the negative influences as debilitating as good readers. In fact, they rated many of them as positive. The most striking example was that poor readers reported that saying each word over and over was a positive comprehension strategy. This data again seems to reflect a decoding concern or goal of poor readers rather than meaning construction. The study suggests that the goals and strategies of poor readers are inappropriate for deriving and monitoring the meaning of passages. Specific teacher instruction may alter their behavior and subsequent comprehension.

Summary

These studies have indicated several differences between good and poor readers in their knowledge about the goals, purposes, and strategies for achieving reading proficiency. It is possible that the often observed poor comprehension and memory of poor readers is due to inappropriate plans and strategies that focus on decoding. Our future research will be aimed at intervention programs to teach poor readers a better understanding and use of constructive comprehension skills.